~~CONFIDENTIAL~~ [redacted]

FOREWORD

This revised document up-dates the LMSD proposal of 15 May 1959 for the Sentry Program. Incorporated are the various changes, revisions, and corrections to the program initiated since the original issue.

The information contained in this document constitutes the definition of the Sentry Program.

Section 1 sets forth the objectives of the total Sentry Program, and therefore, is not confined to any specific funding period. These objectives, which establish the goals toward which effort will be directed, are described for the areas of system requirements, satellite vehicle, ground equipment, facilities, personnel, logistics, and launch plan.

Section 2 presents the work statement for that part of the total Sentry Program to be accomplished during the period between the completion of Contract AF 04(647)-97 and 31 December 1960. This section consists of the statement of work, schedule, summary of items to be furnished, Government-furnished items, and ground equipment.

The Sentry Program designation has been changed to Samos; however, in order to expedite this document, this change has not been made herein.

~~CONFIDENTIAL~~ [redacted]

~~CONFIDENTIAL~~

CONTENTS

SECTION 1 PROGRAM OBJECTIVES

TAB 1 SYSTEM REQUIREMENTS

TAB 2 SATELLITE VEHICLE

TAB 3 GROUND EQUIPMENT

TAB 4 FACILITIES

TAB 5 PERSONNEL

TAB 6 LOGISTICS

TAB 7 LAUNCH PLAN

SECTION 2 WORK STATEMENT

TAB 1 STATEMENT OF WORK

TAB 2 SCHEDULE

TAB 3 SUMMARY OF ITEMS TO BE FURNISHED

TAB 4 GOVERNMENT-FURNISHED ITEMS

TAB 5 GROUND EQUIPMENT

~~CONFIDENTIAL~~ [redacted]

~~CONFIDENTIAL~~

[redacted]

SYSTEM REQUIREMENTS

1. SCOPE

A. GENERAL. The requirements for the Sentry Program, using Agena vehicles as the carriers for reconnaissance equipment, are established in this tab. The development program and overall operational characteristics of the system may be described as follows:

1. DEVELOPMENT PROGRAM

a. The Sentry Program shall provide a satellite reconnaissance system capable of obtaining reconnaissance information which can be integrated into the USAF intelligence data handling system and disseminated to operational military agencies. The Sentry Program, employing orbiting satellites composed of Agena vehicles and reconnaissance payloads, shall provide surveillance of the entire Soviet complex, enabling evaluation of Soviet intention to attack. Timeliness of receipt of the intelligence information with daily reconnaissance coverage of high resolution is the ideal. In consideration of the requirement for earliest availability of the Sentry system, the engineering progression and Air Force acceptance shall be from the lesser to the greater resolution. The research and development effort shall be directed toward providing equipment which shall permit the following:

(1) Coverage of world-wide areas of interest

(2) Detecting new and hiterto unknown targets

(3) Determining electronic signal characteristics

(4) Locating and verifying targets and defenses

(5) Collecting data on technological progress

(6) Evaluating military and industrial strength

(7) Monitoring electronic emissions

(8) Observing enemy build-up indications

[redacted]

~~CONFIDENTIAL~~

(9) Evaluating attack capability

(10) Assessing damage from high-yield weapons

(11) Reconnoitering military movements

(12) Locating naval forces throughout the world.

b. The Sentry Program shall continue over a period of years and include a variety of configurations, capabilities, and useful satellite life spans. The development of the reconnaissance system shall proceed from a relatively simple design to more refined versions capable of meeting stated system requirements. The original design and subsequent development work shall endeavor to keep the basic system design as flexible as possible to provide a relatively rapid reaction to changing requirements. The development program shall include, besides the satellite vehicle and its attendant equipment, development of visual and ferret equipment to provide reconnaissance information, and development of the ground based satellite control system equipment necessary for the collection control of the orbiting vehicles. This equipment shall provide a reconnaissance capability of two modes: readout and recovery.

(1) Readout

(a) Visual Reconnaissance: The reconnaissance equipment for the visual reconnaissance readout portion of the Sentry Program consists of the satellite-borne equipment required to collect information in the visible spectrum, to process and store this information, and on a command signal from the ground to convert stored images to appropriate signals for transmission to the ground. In addition to the satellite-borne equipment, related ground-based equipment shall be required to take the output of the satellite-borne data link and reconstitute the signal into photographic form for system control purposes, vehicle equipment adjustment, engineering evaluation, and for further processing and intelligence use. Initial visual equipment shall be capable of resolving targets 20 feet in size, and development shall continue toward the goal of achieving resolutions of 5 feet or less. Target location shall have an error no greater than ±1 mile with respect to the North American Datum. Future consideration shall be given to the development and use of electrostatic sensors and high-resolution television in conjunction with magnetic tape storage. The vehicle-borne and ground-based equipment shall consist of and be capable of the following functions:

(i) Vehicle Camera: A steerable reconnaissance camera with a film supply shall be capable of providing photographic coverage for the useful reconnaissance life of the vehicle. Means shall

[redacted]

be provided for focus adjustment and exposure control by command signals from the ground stations. The film-drive mechanism shall be capable of being controlled by the programmer on the basis of command signals originating from the ground. A means for indexing the film with time-base information shall be included to assist in providing positional accuracy to ±1 mile for the overall system. The camera will operate on an intermittent basis dependent upon orbital period and orientation. The film supply shall be sufficient to meet the reconnaissance requirements plus serving as leader when required.

(ii) Vehicle Processor: A normal-speed/low-speed 70mm film processor together with its associated equipment shall be capable of processing and drying the film in the satellite vehicle.

(iii) Vehicle Readout: The vehicle readout mechanism shall, on receipt of command signals, be capable of scanning the processed film and generating an output signal from the video amplifier compatible with the reconnaissance data link. The composite video signal output of the readout equipment shall include synchronizing, blanking, and other information as required to record and process the visual data on the ground.

(iv) Vehicle Control and Transport Equipment: The control, transport, and storage equipment shall be capable of executing the command signals provided by the vehicle programmer and command control communications. The functions to be executed shall include, but not be limited to, maintaining correct image motion compensation (IMC) in the camera and supplying programmed or commanded changes to IMC; exposure control and focus operations; film transport functions from the camera through the readout device; operation and sequencing of the film processing and drying; monitoring performance of the readout equipment; and control and sequencing of payload gimbaling mechanism.

(v) Ground Reconstruction Equipment and Monitor (Primary Record): The ground photo reconstruction and processing equipment shall be capable of converting the video signal received from the data link into photographic form and of monitoring the vehicle readout and ground reconstruction equipment. The primary record formed in the above operation will contain the reconnaissance image plus the auxiliary data, and the monitor will provide the means for checking the performance of critical components in the system and for initiating command control of the process

[redacted]

(b) Ferret Reconnaissance: The ferret reconnaissance portion of the Sentry Program consists of the satellite-borne equipment required to collect information from radiation in certain selected regions of the electromagnetic spectrum, to store this information, to filter or index it as may be necessary, and at the proper time to convert the stored information into an appropriate electrical signal for transmission to the ground. Ground-based equipment shall be required for inflight calibration and vehicle equipment adjustment; engineering evaluation of vehicle equipment performance, and transmission of reconnaissance, calibration, attitude, and time information to the data processing activities.

(2) Recovery. The recovery portion of the Sentry Program shall provide a payload which will be designed to obtain high-resolution photographic reconnaissance and shall be capable of achieving 5 foot resolution. The data shall be returned to the earth in a recovery capsule ejected from the satellite vehicle.

2. OVERALL OPERATIONAL CHARACTERISTICS

a. The Sentry Program shall utilize satellite vehicles, modified ICBM boosters, launch facilities, tracking facilities, and a complex communication and data processing network with related facilities. The ICBM booster provides the primary propulsive power to the Sentry satellite vehicle. Separation occurs on attainment of the proper altitude and attitude. As the booster falls away, the satellite vehicle continues in a self-stabilized, predetermined coast to a programmed altitude. Orbital altitudes shall be selected according to mission requirements. At the termination of the coast phase, the satellite orbital boost engine activates, supplying the orbital velocity increment required to establish a substantially circular orbit. The internal controls shall then orient the vehicle to the proper attitude. The most common orbits shall pass within a few degrees of the poles. The vehicle shall complete a revolution of the earth at approximately 94-minute intervals. Because the orbit is essentially fixed in space, while the earth rotates inside it, successive passes over the earth's surface will be displaced slightly more than 22-1/2° at the equator. This offsetting will permit a single vehicle to observe the entire earth in a total time period which depends, in part, on the width of the swath observed.

b. The satellite vehicle equipment used in the readout portion of the Sentry Program will be programmed by a secure ground-space communication link to activate and deactivate visual or electronic sensing equipment over the target area in accordance with operating requirements. When within range of a Sentry ground receiving station, the vehicle shall, upon command, transmit the recorded data. These data will be received, processed, and transmitted to the using agencies. Useful operations will be terminated when air drag changes the orbit sufficiently to prevent operations, or when either the electrical power supply is exhausted or a failure of equipment takes place. Expected useful life for early versions of the readout satellite vehicle is about 10 to 30 days. Expected useful life for later versions of the readout satellite vehicle is more than a year for ferret reconnaissance equipment and 3 to 12 months for visual reconnaissance equipment.

c. The satellite vehicle equipment used in the recovery portion of the Sentry Program shall be programmed to provide high-resolution photo reconnaissance of specific areas of interest. For positioning the satellite vehicle as required to obtain data on specific areas of interest, the orbital period may be adjusted by ground command during the high-resolution flights. Upon recovery, the exposed film shall be transported to the processing and using agencies. Useful operations will be terminated upon command or upon the exhaustion of the film or the electrical power supply. Expected useful life for the high resolution payload is approximately 15 days.

d. The re-entry and recovery sequence of operations may be initiated by the vehicle timer or by ground command. The recovery capsule shall be ejected from the satellite vehicle and propelled in an appropriate re-entry trajectory for air-recovery in the ocean area adjacent to Hawaii. While only over-water recovery is planned herein, the satellite vehicle, recovery capsule, and airborne recovery components and equipment shall be designed to allow for overland recovery within the United States Zone of Interior if required. At the proper altitude a parachute system shall be deployed. Simultaneously, the recovery capsule radio beacon and light beacon shall begin operating. Aircraft specially equipped with direction finder systems and air recovery gear will detect, locate, and accomplish air recovery of the capsule. If over-water air recovery fails, surface vessels, similarly equipped with direction-finder systems, will recover the capsule from the sea with the assistance of helicopters.

B. PROGRAM OBJECTIVES

1. **READOUT**. The objective of the readout portion of the Sentry Program shall be to:

a. Develop and demonstrate the equipment techniques and procedures for launching the Sentry readout vehicles in combination with the Atlas (SM-65) boosters

b. Demonstrate capability of attaining orbit utilizing Sentry readout vehicles in combination with Atlas (SM-65) boosters

c. Develop the equipment for and demonstrate the effectiveness of satellite-borne photographic techniques, including the photographic coverage of specific areas of interest, film processing and storage, and electronic space-ground transmission of visual data

d. Develop the equipment for and demonstrate the effectiveness of satellite-borne electronic reconnaissance techniques, including ferret coverage of specific areas of interest, electronic data storage, and space-ground transmission of ferret data

e. Develop the equipment for and demonstrate the capability of the orbital attitude system to meet the needs of the readout portion of the Sentry Program

f. Develop and demonstrate the equipment, techniques, and procedures for ground-based acquisition, tracking command, and data processing and reconstruction for system control and technical evaluation

g. Develop the equipment for and demonstrate the incremental orbital period adjustment techniques

h. Demonstrate system operating techniques and procedures

i. Develop the equipment for and demonstrate the capability for utilizing solar voltaic collector auxiliary power in satellite reconnaissance vehicles

j. Carry out research leading to the development of all-electronic visual equipment suitable for satellite reconnaissance

k. Develop visual reconnaissance equipment capable of 5-foot ground resolution

l. Develop the capability for utilizing high-energy battery auxiliary power in satellite reconnaissance vehicles

m. Develop the capability for utilizing nuclear auxiliary power in satellite reconnaissance vehicles

n. Develop the capability for extending the coverage of the ferret reconnaissance equipment to include the electromagnetic spectrum from 30 to 300,000 MC/S

o. Assess feedback information from the data user to the satellite ground control system for design improvement and system control.

p. Consideration will be given to the application of dual-burning engine capability and optimized propellant-carrying capacity, developed in the Discoverer Program, to the Sentry vehicle in order to provide for more diversified system capabilities.

2. RECOVERY. The objectives of the recovery portion of the Sentry Program shall be to:

a. Develop and demonstrate the equipment, techniques, and procedures for launching the Sentry recovery vehicles in combination with the Atlas (SM-65) boosters

b. Demonstrate capability of attaining orbit utilizing Sentry recovery vehicles in combination with Atlas (SM-65) boosters

c. Develop the equipment for and demonstrate the capability of the orbital attitude system to meet the needs of the recovery portion of the Sentry Program

d. Develop the equipment for and demonstrate capsule recovery capability by ejecting a capsule from orbit, propelling it into an appropriate descent trajectory, and recovering it by air snatch techniques

e. Demonstrate system operating techniques and procedures

f. Develop the equipment for and demonstrate the use of the Sentry recovery vehicles to accomplish extremely high resolution reconnaissance photography of specific areas of interest

g. Demonstrate the incremental orbital period adjustment techniques

h. Develop and demonstrate the equipment, techniques, and procedures for the satellite ground control system to provide for acquisition, tracking, command, scheduling, recovery control, and data processing for system control and technical evaluation

i. Assess feedback information from the data user to the satellite ground control system for design improvement and system control

j. Consideration will be given to the application of dual-burning engine capability and optimized propellant-carrying capacity, developed in the Discoverer Program, to the Sentry vehicle in order to provide for more diversified system capabilities.

C. FLIGHT MISSIONS. Flight missions shall be defined as those goals toward which each test flight shall be planned and toward which system development effort shall be directed. The flight missions for the Sentry Program shall be as specified in Tables I and II of this tab.

D. ACTIVE ORBITAL LIFE. Active orbital life shall be defined as that period of time on orbit during which useful data is obtained. It is a design objective that the equipment operating on orbit shall be capable of maintaining failure-free operation during the active orbital life period, except that inoperativeness of equipment due to normal exhaustion of energy sources or gas supply shall not be considered as equipment failure.

II. DESIGN CRITERIA

A. PUBLICATIONS. Contractor publications, specifications, drawings, and other documents, with Air Force approval, shall be used in the Sentry Program as indicated in Tabs 2 through 6 of this Section.

III. SYSTEM DESCRIPTION

A. TEST VEHICLES

1. BOOST VEHICLES. Atlas missiles (SM-65) to be used in modified form as the boosters for the Sentry test flights shall be supplied, together with necessary ground support units, as Government-furnished equipment items. The Atlas configuration shall not include the nose cone but shall include the guidance system and appropriate ground equipment such as that used with the "D" Atlas series. The booster and ground equipment shall be modified to make it compatible with the satellite vehicle requirements described in Tab 2 of this Section. Booster performance requirements shall be in accordance with Table III of this tab.

2. SATELLITE VEHICLE. The Sentry satellite vehicles shall be designed in four basic configurations for the readout portion of the Sentry Program and in one basic configuration for the recovery portion of the Sentry Program as defined in Tab 2 of this Section. Differences between vehicles shall consist of those changes necessary to satisfy the technical requirements of the Sentry Program objectives. For the readout portion of the Sentry Program the satellite vehicle shall consist of the Agena vehicle and payloads as follows:

a. AGENA

(1) Airframe (Subsystem A)

(2) Propulsion (Subsystem B)

(3) Auxiliary Power (Subsystem C)

(4) Guidance and Control (Subsystem D)

(5) Vehicle-borne Communications (Subsystem H).

b. PAYLOAD

(1) Visual Reconnaissance (Subsystem E)

(2) Ferret Reconnaissance (Subsystem F).

For the recovery portion of the Sentry Program the satellite vehicle shall consist of the Agena vehicle and payloads as follows:

a. AGENA

(1) Airframe (Subsystem A)

(2) Propulsion (Subsystem B)

(3) Auxiliary Power (Subsystem C)

(4) Guidance and Control (Subsystem D)

(5) Vehicle-borne Communications (Subsystem H).

b. PAYLOAD

(1) Recovery Capsule (Subsystem L)

(2) Visual Reconnaissance (Subsystem E).

B. GROUND EQUIPMENT

1. SPECIAL TEST EQUIPMENT. Special test equipment shall be defined as that equipment which is so specialized that its use is peculiar to the performance of the inplant testing processes required for the Sentry Program. This equipment shall include the special test equipment described in Tab 3 of this Section.

2. GROUND SUPPORT EQUIPMENT. Ground support equipment shall be defined as any or all non-vehicle-borne implements or devices which are required to inspect, test, adjust, calibrate, appraise, gage, measure, repair, overhaul, assemble, disassemble, service, transport, safeguard, record, store, actuate, or otherwise perform a

function in support of the Sentry satellite vehicle. This equipment includes ground handling equipment, ground servicing equipment, launch monitor and control equipment, vehicle subsystem and vehicle system checkout equipment as described in Tab 3 of this Section.

3. SATELLITE GROUND CONTROL EQUIPMENT. Satellite ground control equipment shall include all ground equipment necessary to provide for centralized system control for the launched vehicles and for the orbiting satellites. This includes ground-based communications equipment and all non-vehicle-borne specialized equipment required to transmit, receive, check out and test, record, analyze, process, store, decode indexed information, display, safeguard, or otherwise perform functions at tracking, acquisition and readout sites and at control centers immediately subsequent to launch and throughout the satellite's orbiting life. This equipment includes VERLORT radar equipment, VHF acquisition and tracking equipment, ground control and display equipment, data handling and computation equipment, VHF data receiving equipment, UHF acquisition and tracking equipment, UHF data receiving equipment, UHF command transmitting equipment, payload ground equipment, ground timing and display equipment, intra/interstation communications and data transmission equipment, alignment and calibration equipment, and miscellaneous equipment as described in Tab 3 of this Section.

C. TEST OPERATIONS

1. SANTA CRUZ TEST BASE. The Santa Cruz Test Base shall provide test operations involving the capability of testing components, subsystems, and satellite vehicles including engine firing, as required for development and acceptance testing.

2. LAUNCH BASE, VANDENBERG AFB, CALIFORNIA. All satellite vehicles of the Sentry Program shall be launched from Vandenberg AFB - Point Arguello. Base test operations shall include:

a. Vehicle assembly

b. Vehicle subsystem and system checkout, modification, and repair

c. Countdown, monitor, and launch.

Base facilities and ground equipment will be provided in accordance with the requirements established in Tabs 3 and 4 of this Section.

3. TRACKING AND ACQUISITION STATIONS. Seven tracking and acquisition stations shall be used for the Sentry Program and shall be located as follows:

a. Vandenberg AFB, California

b. Kaena Point, Hawaii

c. New Boston, New Hampshire

d. Ottumwa, Iowa

e. Fort Stevens, Oregon

f. Point Mugu, California

g. Kodiak Island, Alaska.

Each station shall have the capability to acquire, track, and command the satellite vehicle and to receive telemetry and reconnaissance readout data transmitted from the vehicle except:

a. Kaena Point shall have no reconnaissance data readout capability

b. Point Mugu will be used for launch tracking and ascent telemetry only

c. Kodiak Island will be used for VERLORT tracking only

d. Vandenberg AFB shall have added VHF telemetry capability to provide real time telemetry data displays and recordings for the Atlas booster during the boost phase.

Facilities and equipment shall conform to the requirements of Tabs 3 and 4 of this Section.

4. TELEMETRY SHIP. A ship equipped with manually trained antennas and telemetry receiving and recording equipment and with ferret inflight calibration equipment shall be used to obtain telemetry data and to perform inflight calibration of ferret equipment. The ship shall be stationed at appropriate position to receive telemetry data transmitted from the satellite vehicle. The facilities and equipment shall conform to the requirements of Tabs 3 and 4 of this Section.

5. SPACE TRACK TRACKING STATIONS. The facilities of Space Track shall be utilized to provide additional data on vehicle orbital position during the recovery portion of the Sentry Program. The positional data derived from Space Track optical tracking activities shall be integrated into the computations undertaken for high-accuracy determination of vehicle orbital position.

6. DEVELOPMENT CONTROL CENTER, SUNNYVALE. Sentry flight test operations shall be centrally controlled and directed from the Development Control Center. The Development Control Center is the hub of the communications network and is the focal point for all systems status and control preceding and during launch operations. Also, the Center, including the computer facilities, provides for centralized system control for the orbiting satellites and centralized collection control for the sensor equipments. Such sensor control includes equipment scheduling, command programming, calibration evaluation, and integrated data handling. This Center shall conform to the requirements of Tabs 3 and 4 of this Section.

7. VANDENBERG CONTROL CENTER. Launch and orbit injection operations at the launch base, the tracking and acquisition stations at Vandenberg AFB and Point Mugu, and the telemetry ship shall be monitored and coordinated by the Vandenberg Control Center. Operations at the launch pad will be under specific control and direction from the blockhouse. The equipment of the Vandenberg Control Center shall conform to the requirements of Tab 3 of this Section.

8. HAWAIIAN CONTROL CENTER. The Hawaiian Control Center located at Hickam AFB, Hawaii, shall dispatch and control air and sea elements of the recovery force during recovery operations in the area of the Hawaiian Islands. This Center shall be equipped with necessary communications to permit real-time command and control of both the airborne and seaborne elements of the recovery force. The Hawaiian Control Center shall conform to the requirements of Tabs 3 and 4 of this Section.

9. RECOVERY FORCE. The recovery force shall consist of a minimum of four aircraft and two naval vessels. Both the aircraft and the naval vessels shall be equipped with 360° search, long-range direction-finding equipment. The aircraft shall also be equipped with air snatch equipment that can be deployed during flight at the aircraft's cruising speed. This recovery force shall be assigned to the Hawaiian Control Center for recovery operations in the vicinity of the Hawaiian Islands. Helicopters will be carried by the surface vessels to accomplish visual search in case of water impact.

10. USAF WEATHER FORECASTING. The USAF weather forecasting service will provide up-to-date estimates of the weather conditions existing at the targets to be photographed by the Visual Recovery Reconnaissance system.

D. SYSTEMS SUPPORT

1. PERSONNEL. Contractor-furnished personnel shall be assigned to all facilities listed above except for the Space Track optical tracking stations and the recovery force. A personnel selection and training program shall be planned and conducted as outlined in Tab 5 of this Section, so that all Contractor-furnished personnel will be qualified for the jobs assigned.

2. LOGISTICS. A logistic support program shall be developed and implemented so that the Sentry Program shall be adequately supported through the provision of stocks of equipment, material, and spare parts, and through the establishment of maintenance facilities as outlined in Tab 6 of this Section.

IV. TESTING REQUIREMENTS

A. FLIGHT TESTING. Each satellite vehicle shall be flight tested at Vandenberg AFB, using the facilities described above. Prior to each flight, a Flight Test Directive shall be prepared and shall establish the test objectives for that flight. These flight test objectives shall consist of three categories which are defined as follows:

1. PRIMARY OBJECTIVES. Those flight test objectives which are essential to and which contribute directly to the fulfillment of the program objectives shall be termed primary objectives. Any malfunction of test vehicle or ground equipment shall constitute grounds for holding, recycling, or terminating the launch countdown. Any tendency toward malfunction of equipment, deterioration of weather conditions, or change of range status that could in any manner jeopardize the accomplishment of a primary objective shall be sufficient justification to delay the test.

2. SECONDARY OBJECTIVES. Those flight test objectives which are highly desirable, but are not essential to the fulfillment of the program objectives, shall be termed secondary objectives. If the accomplishment of any secondary objective appears to be in jeopardy at any time prior to initiation of the booster automatic launch sequence, as determined by the Flight Test Controller, the countdown may be held or recycled to resolve the difficulty.

3. TERTIARY OBJECTIVES. Those flight test objectives which contribute to design research, environmental research, associated projects, or other supporting engineering effort shall be termed tertiary objectives. There shall be no delay, hold, or recycling of a countdown to assure accomplishment of a tertiary objective. Launch schedule rearrangements to favor the achievement of a tertiary objective shall be

considered desirable when, in the opinion of the Flight Test Controller, such rearrangements can be tolerated.

B. GROUND TESTING

1. **SATELLITE VEHICLE TESTING.** Satellite vehicle acceptance testing, including engine firing, shall be performed on each of the satellite vehicles to provide an accurate final checkout of the complete vehicle. These tests shall be conducted in accordance with the test specifications applicable to each vehicle as described in LMSD-445087, "Specification Program for Discoverer, MIDAS, and Sentry," dated 15 April 1959.

2. **SATELLITE GROUND CONTROL TESTS.** Satellite ground control tests shall be conducted as necessary to assure the functional effectiveness of the control and communications networks between and within tracking, acquisition, and readout stations, launch bases, and control centers; the data links; telemetry and reconnaissance data handling, system status, and display equipment; and the computer facilities.

V. RELIABILITY REQUIREMENTS

A. **RELIABILITY OBJECTIVE.** Reliability of the Sentry Program shall satisfy the following objective:

1. The average output of the system, the output being measured at the point of issue of the reconnaissance information from the ground processing station, shall not be reduced by the effects of equipment unreliability by more than the amounts specified in LMSD-427102, "Reliability Requirements and Reliability Program for Sentry Program," dated 19 March 1959.

TABLE I

FLIGHT MISSIONS (READOUT)

The four flight missions of the readout portion of the Sentry Program are distinguished by progressive advance in technology toward a system for readout of high resolution photo and advanced ferret reconnaissance data. These missions have been established as follows:

FLIGHT MISSION I (Dual Payload)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing E-1 visual equipment, read out pre-exposed and pre-processed film, process and read out pre-exposed film, and perform total subsystem operation within the capability limits imposed by the dual payload configuration.

4. Utilizing the F-1 ferret equipment, monitor electromagnetic emissions, quantize and store significant characteristics of these emissions, and read out these data via the vehicle-ground communication link to evaluate ferret reconnaissance techniques.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Collect, record, and transmit telemetered data.

8. Demonstrate the capability of the satellite ground control system to maintain control of system operations.

FLIGHT MISSION II (Dual Payload)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing the E-1 visual equipment, read out pre-exposed and pre-processed film, process and read out pre-exposed film, and perform total subsystem operation within the capability limits imposed by the dual payload configuration.

4. Utilizing the F-2A ferret equipment, monitor electromagnetic emissions, quantize and store significant characteristics of these emissions, and read out these data via the vehicle-ground communication link to evaluate ferret reconnaissance techniques.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Collect, record, and transmit telemetered data.

8. Demonstrate the capability of the satellite ground control system to maintain control of system operations.

FLIGHT MISSION III (Medium-Resolution Photo Reconnaissance)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing the E-2 visual reconnaissance equipment, demonstrate the ability to photograph specific areas of interest, process the exposed film, and electronically sense and read out the information via the vehicle-ground communications link.

4. Test and evaluate a vehicle auxiliary power system, which incorporates solar voltaic collectors, primary, and secondary batteries.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Demonstrate the capability of the satellite ground control system to maintain control of multiple satellite operation.

FLIGHT MISSION IV (Ferret Reconnaissance)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing the F-2B, F-3A, and F-3B ferret equipment, in flight vehicles of Configuration IV monitor electromagnetic emissions, quantize and store significant characteristics of these emissions, record special signals by analog methods, and read out the data via the vehicle-ground communication link to evaluate ferret reconnaissance equipment.

4. Test and evaluate a vehicle auxiliary power system which incorporates solar voltaic collectors, primary, and secondary batteries.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Demonstrate the capability of the satellite ground control system to maintain control of multiple satellite operation.

8. Obtain and process geophysical data.

TABLE II

FLIGHT MISSION (RECOVERY)

The flight mission of the recovery portion of the Sentry Program is designed to obtain high resolution photographic information.

__FLIGHT MISSION__ (High-Resolution Surveillance)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Evaluate precise vehicle position and attitude determination techniques.

4. Test and evaluate a vehicle auxiliary power system which incorporates solar voltaic collectors, primary, and secondary batteries.

5. Test and evaluate the capability of the camera system to provide high-resolution photographic coverage of specific areas of interest.

6. Test capsule separation, retrodynamics, thermal protection and recovery techniques.

7. Evaluate orbital period adjustment, control, and computing systems.

8. Demonstrate the capability of the satellite ground control system equipment and facilities to control system operations, and to collect, record, and assess telemetered data.

TABLE III
ATLAS (SM-65) BOOSTER PERFORMANCE REQUIREMENTS

The Atlas missile furnished by the Government shall have a minimum booster exit performance as established by the following parameters. This performance is based upon a launch gross weight of the satellite vehicle limited to 11,600 pounds.

	Sustainer	Booster	Each Vernier	
			Pump Fed	Tank Fed
Thrust (lb)	56713 ± 3%	308366 ± 3%	1000 ± 3%	985 ± 3%
Specific Impulse (minimum)	215	245	220	214

3σ Variation in required nominal apogee altitude ± 2000 feet

3σ Variation in required nominal apogee velocity ± 2 feet per second

3σ Variation in required nominal orbit plane inclination ± 0.5 degree

SATELLITE VEHICLES

I. SCOPE

A. GENERAL. The performance requirements of the satellite vehicles comprising the space-borne test platforms to be used in exploiting the technical capabilities of the Sentry Program are established in this tab.

B. DESIGN OBJECTIVE. The basic objective of the satellite vehicle shall be to achieve flight mission capability defined in Tab 1 of this Section. The satellite vehicle shall be designed in four basic configurations for the readout portion of the Sentry Program and one basic configuration for the recovery portion of the Sentry Program. The design will satisfy the requirements of Table 1, Nominal Performance, and Table II, Flight Missions and Configurations, of this tab.

II. DESIGN CRITERIA

A. PUBLICATIONS. The following publications shall be used in the design of the satellite vehicles for the Sentry Program:

1. MILITARY. The following military specification shall be used as a guide:

a. MIL-I-26600 (USAF), "Interference Control Requirements, Aeronautical Equipment," dated 2 June 1958.

2. LOCKHEED MISSILES AND SPACE DIVISION

a. Compliance with the following Contractor specifications shall be required. Later Air Force approved revisions shall be subject to separate negotiations.

(1) LMSD-6224, "Airframe Subsystem Specification (SM-65 and Battery Auxiliary Power)," Revision D, dated 26 May 1959

(2) LMSD-423965, "Airframe Subsystem Specification (SM-65 and Solar Power) MIDAS Program," Revision B, dated 26 May 1959

(3) LMSD-6161, "Propulsion Subsystem Specification (UDMH Configuration) for Discoverer Program," Revision B, dated 27 July 1959

(4) LMSD-2959, "Model Specification, Engine, Rocket, Liquid Propellant, USAF Model XLR-81-BA-5," Revision A, dated 31 March 1959

(5) LMSD-6226, "Subsystem C Battery Auxiliary Power Supply Specification (Atlas Configuration)," Revision B, dated 25 February 1959

(6) LMSD-423966, "Subsystem C Solar Auxiliary Power Supply Specification (Atlas Configuration)," dated 20 April 1959

(7) LMSD-6227, "Guidance and Control Subsystem Specification, Programs I, II, and III," dated 31 December 1958

(8) LMSD-6229, Subsystem E Specification for E-1 (Component Test) Payload," dated 30 April 1959

(9) LMSD-445000, "Subsystem F Specification for F-1 Equipment," dated 15 May 1959

(10) LMSD-6231, "Subsystem F Specification for F-2 Equipment," Revision A, dated 18 March 1959

(11) LMSD-6117A, "General Environmental Specifications for Discoverer, MIDAS, and Sentry Programs," Revision A, dated 24 June 1959.

b. Compliance requirements for the following Contractor specifications which are to be prepared shall be subject to both Air Force approval and separate negotiations.

(1) LMSD-445043, "Subsystem A Specification, Sentry Program".

(2) LMSD-6230, "Subsystem E Specification for E-2 Equipment".

(3) LMSD-424178, "Subsystem E Specification for E-5 Equipment".

(4) LMSD-6232, "Subsystem F Specification for F-3 Equipment".

(5) LMSD-6234, "Ground-Space Communications Subsystem Specification for Sentry Program".

(6) LMSD-445044, "Subsystem H Specification, Sentry Program".

(7) LMSD-424175, "Re-Entry Capsule Specification".

III. SATELLITE VEHICLE CONFIGURATION

A. READOUT

1. FLIGHT CONFIGURATION I. Flight Configuration I shall be as follows:

a. AGENA

(1) Airframe. The satellite vehicle airframe shall consist of the following: The nose-cone assembly, a part of which shall be jettisonable; the forward midbody assembly, including the forward equipment rack and payload supports; the aft midbody assembly; the aft equipment rack; the propellant tanks; the pressure spheres; fairings; antenna and instrumentation booms; and the adapter assembly, including the provisions for retro-rockets. The airframe shall be the carrier for the equipment it houses and supports and shall provide the necessary environmental protection, structural integrity, and alignment. During the coast phase the vehicle airframe shall separate from its adapter, which shall have been attached to the Atlas booster during ground preparation for launch.

(2) Propulsion. The satellite vehicle propulsion subsystem shall consist of the rocket engine and associated equipment. The rocket engine, USAF Model No. YLR-81-BA-5, shall incorporate a single thrust chamber assembly; oxidizer and fuel valves; a turbine pump assembly, including a gas generator, turbine and gear box, oxidizer and fuel pumps, and turbine exhaust duct; an engine mount, including a gimbal ring; and associated switches, valves, plumbing, and wiring. The associated equipment shall include the ullage control rockets; the propellant pressurization equipment, including necessary regulators, valves, and plumbing; and the necessary auxiliary equipment. The liquid propellants shall consist of inhibited red fuming nitric acid (IRFNA) as the oxidizer, and unsymmetrical dimethylhydrazine (UDMH) as the fuel. The propulsion subsystem shall be capable of providing the second stage thrust to enable the satellite vehicle to achieve the velocity necessary to accomplish its mission after separation from the Atlas booster.

(3) Auxiliary Power. The auxiliary power subsystem shall consist of silver peroxide-zinc primary batteries, inverters, a voltage regulator, wiring harness, the flight termination equipment, a power switch, a limiter assembly, and associated connectors, plugs, terminal strips, attachments, and wiring. The subsystem shall be capable of supplying electrical power for all vehicle equipment requiring such power, except for the flight termination equipment which shall have its own power supply.

(4) Guidance and Control. The guidance and control subsystem shall consist of: guidance, including the computer, the timer, the inertial reference package, the horizon scanner, and the secondary junction box; flight control, including electronics, pneumatic, and hydraulic controls; orbital stabilization equipment, including the attitude damping system; and equipment for measuring and recording attitude to satisfy reconnaissance equipment performance requirements. The guidance and control subsystem shall be capable of establishing attitude references and aligning the vehicle with them during the coast, orbital boost, and reorientation phases and it shall be capable of determining vehicle velocity and of terminating engine thrust when the correct velocity has been reached. In addition, the guidance and control subsystem shall initiate programmed signals for starting, stopping, and maintaining various system equipment operations during the coast, orbital boost, and reorientation phases.

(5) Vehicle-Borne Communications. The vehicle-borne communications shall consist of:

(a) Radar Transponder: An S-band radar transponder shall transmit a signal triggered by the signal received from the VERLORT radar to provide the capability for accurate long range tracking of the vehicle at tracking and acquisition sites not equipped with the UHF system. The transponder shall be equipped with a decoder so that real-time commands may be transmitted over the radar beam to initiate equipment functions within the vehicle.

(b) VHF Acquisition Transmitter: A miniaturized, transistorized, low-power VHF transmitter shall be used to emit the signal which will assist the initial acquisition and angle tracking of the vehicle.

(c) UHF Command Receiver: A UHF command receiver shall be used to receive program commands and ranging signals. The command signals provide real-time activation of equipment functions or are stored in the vehicle for later use. Accurate transmission and reception of command signals is noted by verification over the return telemetry link. The ranging signals are returned to the ground over the narrow-band data transmitter for comparison with the transmitted tones for the determination of range data.

(d) Sequence Programmer: A sequence programmer shall be used to provide an accurate clock, a program storage, and a sequenced control for reading out and executing stored or real-time commands. The programmer shall be capable of furnishing timing signals for vehicle functions or for vehicle position indexing. It shall be subject to overriding by ground command.

(e) Intermediate Storage Unit: An intermediate storage unit shall be used to provide additional stored program command and real-time command capacity to supplement the command capability of the sequence programmer in support of the visual and ferret reconnaissance payloads.

(f) PAM Multiplexer. A PAM multiplexer shall be used to sample and encode the outputs from a number of information sources for transmission to the ground over the UHF narrow-band data transmitter.

(g) UHF Wide-Band Data Transmitter. A UHF wide-band data transmitter shall be used to transmit wide-band reconnaissance data to the ground based data link receivers in accordance with either programmed or real-time commands received from the ground. This equipment shall deny useful information to unfriendly receivers and shall prevent exploitation of transmission for unfriendly purposes.

(h) UHF Narrow-Band Data Transmitter: A UHF narrow-band data transmitter shall be used to transmit narrow-band reconnaissance, ranging tones, environment, equipment status, scientific, or other useful data to the ground receiver.

(i) VHF Narrow-Band Data Transmitter: A VHF narrow-band transmitter shall be used to transmit the stored F-1 reconnaissance data to the ground receiver.

(j) Mixer-Filter Unit: A mixer-filter unit shall be used to provide separation of ranging tones and command information from command receiver output for return to ground stations via the narrow-band data transmitter; to provide sub-carrier signals used for transmission of visual and ferret reconnaissance telemetry data; and to combine such data with returning ranging and command information, for transmission via the narrow-band data transmitter.

(k) Vehicle Antennas: Because of the interaction between antennas in the vehicle, antennas shall be provided as integrated systems for all vehicle requirements.

(l) FM/FM Telemeter: Unitized FM/FM telemeters shall be installed. Tape recorders shall be installed with a high ratio of read-in to readout time. The tape recorder shall be of a continuous loop design and two recording tracks shall be provided for recording the outputs of two commutators. The recorder-reproducers shall be programmed for read-in and for off periods by the recorder programmer.

b. PAYLOAD.

(1) Visual Reconnaissance. The visual reconnaissance subsystem shall consist of film supply and take-up, test cameras, a film processor, web supply and take-up, storage loopers, an electronic readout system, thermal and humidity control, equipment mounting structure, pressure housing, and circuitry for executing real-time and programmed commands. The E-1 equipment shall have the capability to process pre-exposed film. electronically sense, and read out the information via the vehicle-ground communications link. E-1 equipment also will be capable of exposing raw film within the limitations imposed by the dual payload configuration.

(2) Ferret Reconnaissance. The ferret reconnaissance subsystem for F-1 shall consist of antennas, receivers, data handling equipment, a recorder, and control equipment. Frequency bands [redacted] are scanning superheterodynes which shall provide a high probability of intercept. The data handling system converts the output of the receivers to coded digital signals which are stored by the magnetic tape recorder. The control system turns the equipment on and off for read-in of intercept data over the area of interest and readout of coded data over a tracking station. Each intercept consists of a digital word containing measurements of pulse repetition frequency, pulse width, vehicle time, and frequency.

2. FLIGHT CONFIGURATION II.

a. AGENA

(1) Airframe. Shall be the same as for Flight Configuration I.

(2) Propulsion. Shall be the same as for Flight Configuration I.

(3) Auxiliary Power. Shall be the same as for Flight Configuration I.

(4) Guidance and Control. Shall be the same as for Flight Configuration I.

(5) Vehicle-borne Communications. Shall be the same as for Flight Configuration I, except that the VHF narrow-band data transmitter shall be deleted and the ferret reconnaissance data shall be transmitted by the UHF narrow-band data transmitter to the ground receiver.

b. PAYLOAD.

(1) Visual Reconnaissance. Shall be the same as Flight Configuration I.

(2) Ferret Reconnaissance. The ferret reconnaissance subsystem shall consist of F-2A type equipment which has additional design capabilities to intercept, measure, store, and read out [redacted] The data handling equipment shall convert the output of the receivers to coded digital signals which are stored by a fast start-stop magnetic tape recorder. The control equipment shall operate from stored commands or real-time commands from the ground which control read-in and read-out times, adjust equipment, or switch various redundant components in or out of the system to achieve higher reliability. The in-flight calibration equipment transmits a signal of accurately known characteristics to the F-2A equipment. When this signal is read out in digital form, it is compared by the ground data handling equipment with the transmitted signal to obtain F-2A calibration information. As a result of ground evaluation of F-2A operation, various commands may be transmitted to the vehicle to adjust components of the receiving equipment.

3. FLIGHT CONFIGURATION III.

a. AGENA.

(1) Airframe. Shall be the same as for Flight Configuration II except for the provisions for the solar voltaic collector array and provisions for installing on all vehicles of this configuration after the first, the auxiliary propulsive devices.

(2) Propulsion. Shall be the same as for Flight Configuration II, except that for all vehicles of this configuration after the first, auxiliary propulsive devices shall be included to provide incremental velocity components for the purpose of adjusting the orbit period and providing ullage control.

(3) Auxiliary Power. Shall be the same as for Flight Configuration II except that solar power photovoltaic equipment, combined with secondary batteries, shall power the E-2 equipment, the data link, command equipment, and the guidance equipment.

(4) Guidance and Control. Shall be the same as for Flight Configuration II, except for capabilities required for orbit period adjustment.

(5) Vehicle-borne Communications. Shall be the same as for Flight Configuration II except that the S-band radar transponder, the VHF acquisition transmitter, and the intermediate storage unit shall be deleted, and the sequence programmer shall be replaced by a command programmer and decoder. In addition, the PAM multiplexer will be replaced by a more advanced unit.

b. PAYLOAD

(1) Visual Reconnaissance. The visual reconnaissance subsystem for E-2 shall consist of a 36-inch focal length lens, associated 70mm camera and controls, film supply and take-up, two speed film processor, web supply and take-up, storage loopers, electronic readout system, thermal and humidity control, equipment mounting structure, pressure housing, and circuitry for executing real-time and programmed commands. The payload will be trainable to provide for oblique and/or stereo aerial photography. The E-2 equipment shall have the capability to aim the camera and photograph specific areas of interest, process the exposed film, and electronically sense and read out the information via the vehicle-ground communications link. The resultant photography shall have a design goal for a ground resolution of less than 20 feet.

4. FLIGHT CONFIGURATION IV.

a. AGENA.

(1) Airframe. Shall be the same as for Flight Configuration III.

(2) Propulsion. Shall be the same as for Flight Configuration III.

(3) Auxiliary Power. Shall be the same as for Flight Configuration III.

(4) Guidance and Control. Shall be the same as for Flight Configuration III.

(5) Vehicle-Borne Communications. Shall be the same as for Flight Configuration III except that the wide-band transmitter shall be omitted on the first three flight vehicles of this configuration and an additional UHF narrow band data transmitter substituted.

b. PAYLOAD.

(1) Ferret Reconnaissance. The ferret reconnaissance subsystem shall consist of F-2B, F-3A, and F-3B equipment installed in flight vehicles of this configuration. The first flight vehicle will contain [redacted]

The fourth and fifth flight vehicles will contain F-3B equipment which shall provide extended capabilities over the F-3A system in collecting Technical Intelligence information. The capabilities of the F-3B system shall be as follows:

(a) 6 MC/S bandwidth analog recording

[redacted]

1014

B. RECOVERY.

1. FLIGHT CONFIGURATION I.

a. AGENA.

(1) Airframe. The satellite vehicle airframe subsystem shall consist of the following: the nose section, including the housing for the recovery capsule; the forward equipment structure, including the forward equipment rack; the center midbody; the aft midbody and engine support cone assembly; the aft equipment rack; the booster adapter including provisions for retro-rockets; the propellant tanks; the pressure spheres; and the fairings. The airframe shall be the carrier for the equipment it houses and supports, including the recovery capsule, and shall provide the necessary environmental protection, structural integrity, and alignment. During the coast phase, the vehicle airframe shall separate from its adapter, which shall have been attached to the Atlas booster during preparation for launch.

(2) Propulsion. The satellite vehicle propulsion subsystem shall consisit of the rocket engine and associated equipment. The rocket engine, USAF Model No YLR-81-BA-5, shall incorporate: a single thrust chamber assembly; oxidizer and fuel valves; a turbine pump assembly, including a gas generator, turbine and gear box, oxidizer and fuel pumps,

and turbine exhaust duct; an engine mount, including a gimbal ring; and associated switches, valves, plumbing, and wiring. The associated equipment shall include the ullage control rockets; the propellant pressurization equipment, including necessary regulators, valves, and plumbing; and the necessary auxiliary equipment. The liquid propellants shall consist of inhibited red fuming nitric acid (IRFNA) as the oxidizer and unsymmetrical dimethylhydrazine (UDMH) as the fuel. The propulsion subsystem shall be capable of providing the second-stage thrust necessary to enable the satellite vehicle to achieve the velocity necessary to accomplish its orbit mission, after separation from the Atlas booster. Additionally, auxiliary propulsive devices shall be included to provide incremental velocity components for the purpose of adjusting the orbital period.

(3) Auxiliary Power. The auxiliary power subsystem shall consist of primary and secondary batteries, a solar-voltaic collector array, inverters, voltage regulators, wiring harness, the flight termination equipment, a power switch, load limit assemblies, and associated connectors, plugs, terminal strips, attachments, and wiring. The subsystem shall supply required electrical power to the vehicle and payload during ascent and orbit. An independent battery and associated circuitry shall be provided for the flight termination equipment. A separate auxiliary power supply will be integrated into the recovery capsule and shall consist of silver-peroxide-zinc batteries, power converters and inverters, voltage regulator, and control components. The power supply shall provide required electrical power to the recovery capsule during re-entry and recovery.

(4) Guidance and Control. The guidance and control subsystem shall consist of guidance, including the computer, the timer, the inertial reference package, the secondary junction box, and the horizon scanner; flight control, including the electronic, pneumatic, and hydraulic controls, and equipment for measuring and recording attitude to satisfy payload requirements. The guidance and control subsystem shall be capable of establishing attitude references and aligning the vehicle with them during the coast, orbital boost, and orbit phases and shall initiate programmed signals for starting, stopping, and maintaining various equipment operations during these phases. In addition, the guidance and control subsystem shall position the satellite to the proper retroangles for separation and reentry.

(5) Vehicle-Borne Communications. The vehicle-borne communications shall consist of:

(a) UHF Command Receiver: A UHF command receiver, consisting of a receiver, input devices to command decoding equipment, and other necessary equipment, shall be used to receive operational program commands, time signals, antenna orientation signals, and other ground to space control signals. The command signals provide real-time activation of equipment functions or are stored in the vehicle for subsequent use. Accurate transmission and reception of command signals is noted by verification over the return telemetry link.

(b) Command Programmer: A command programmer and decoder shall be used to provide an accurate clock, a program storage, and a sequenced control for reading out and executing stored or real-time commands. The programmer shall be capable of furnishing timing signals for vehicle functions or for vehicle position indexing; it shall be subject to modification or overriding by ground command.

(c) PAM Multiplexer: A PAM multiplexer shall be used to sample and encode the output from a number of information sources for transmission to the ground.

(d) UHF Narrow-Band Data Transmitter: A UHF narrow-band data transmitter shall be used to transmit range, environment, equipment status, scientific, and other useful data to the ground receivers.

(e) Vehicle Antennas: Because of the interaction between antennas in the vehicle, antennas shall be provided as integrated systems for all vehicle requirements.

(f) FM/FM Telemeter: A unitized FM/FM telemeter shall be installed. A tape recorder shall be installed with a high ratio of read-in to readout time The tape recorder shall be of a continuous loop design and two recording tracks shall be provided for recording the outputs of two commutators. The recorder-reproducers shall be programmed for read-in and for off periods.

b. PAYLOAD.

(1) Visual Reconnaissance. The visual reconnaissance subsystem shall consist of a long focal length camera with time and attitude recording devices, film control, transport, ejection doors for camera aperture, control circuits capable of executing command signals from the vehicle programmer, and a suitable mounting structure. Provision shall be made for interchangeable mechanical and electrical connections with the vehicle and recovery capsule. The subsystem shall include environmental control equipment. The long-focal-length camera system shall be designed for an ultimate capability of achieving a five foot resolution. The locational accuracy of the photographic data shall be one mile.

(2) Recovery Capsule. The recovery capsule subsystem shall consist of the equipment to be recovered plus all associated equipment to house, operate and detach the recovery payload. Recoverable equipment

shall include film cassettes and associated motor drive, mounting structure, stowing device, films and photographic equipment, accelerometer, acquisition and homing beacon, retro-propulsion assembly including retro and spin rockets, retro rocket separation system, light beacons, stabilization equipment, and velocity integrator and thrust termination equipment. During early development flights, a telemeter and tape recorder shall be included in the capsule to measure performance during reentry. Recovery aids shall include the capsule heat shield, radio beacon, and light beacon.

IV. TESTING REQUIREMENTS.

A. GROUND TESTS. In addition to satellite vehicle tests described in Tab 1, components, subassemblies, assemblies, and subsystems shall be subjected to development tests, qualification tests, and inspection tests as applicable. These tests are defined as follows:

1. DEVELOPMENT TESTS. Development tests shall be defined as those tests conducted on equipment or material for the purpose of evaluation of performance, operation, and limits.

2. QUALIFICATION TESTS. Qualification tests shall be defined as those tests conducted on equipment or material for the purpose of evaluation of the operation under environmental conditions specified in the environmental specifications listed in Paragraph II of this tab.

3. INSPECTION TESTS. Inspection tests shall be defined as those tests conducted on articles of a given design for the purpose of maintaining surveillance of quality in accordance with specified requirements.

Table I
NOMINAL PERFORMANCE

	Readout				Recovery
Flight Configuration	I	II	III	IV	I
Orbit Empty Weight (lb)	4280	4280	4280	4110	4630
Injection Alt (s mi)	300	300	300	335F-2B 365F-3	150-200
Mean Alt (s mi)	300	300	300	335-365	150-200
Orbital Period (min)	94	94	94	95.5	90.6
Active Life (days	12-15	12-15	120	365+	15-30

Table II
FLIGHT MISSIONS AND CONFIGURATIONS

Readout					
Flight Vehicle	Flight Mission				
	I	II		III	IV
1	FC-1				
2	FC-1				
3		FC-II			
4				FC-III	
5					FC-IV
6				FC-III	
7					FC-IV
8				FC-III	
9					FC-IV
10				FC-III	
11					FC-IV
12				FC-III	
13					FC-IV
14				FC-III	

Recovery		
Flight Vehicle	Flight Mission	
	I	
1	FC-1	
2	FC-1	
3	FC-1	
4	FC-1	

GROUND EQUIPMENT

I. SCOPE

A. GENERAL. The requirements for ground equipment are established for the Sentry Program in this tab. The ground equipment shall consist of the following major categories: special test equipment, ground support equipment, and satellite ground control equipment.

B. OBJECTIVES. The basic objective of ground equipment is to meet the satellite vehicle ground based equipment requirements necessary to achieve program objectives and flight missions as outlined in Tab 1 of this Section. Special emphasis shall be given to consideration of human factors, ruggedness of construction, simplicity and compactness of design, reliability, and convenience of handling. Weight and size shall be kept to a minimum consistent with strength and functional requirements. Provisions for the safety of personnel shall be incorporated to the maximum extent possible with regard to anticipated operating conditions and the capability of operating personnel. Insofar as practical, test ground support equipment shall be designed to prototype operational configurations.

II. DESIGN CRITERIA

A. PUBLICATIONS. The following publications shall be used in the design of ground equipment for the Sentry Program:

1. MILITARY. The following military specifications shall be used as guides:

a. MIL-M-8090B (ASG), "Mobility Requirements, Ground Support Equipment, General Specifications for, dated 14 March 1958.

b. MIL-E-4970 (USAF), "Environmental Testing, Ground Support Equipment, General Specification for," dated 1 June 1955.

c. MIL-A-8421A, "Air Transportability Requirements, Ground Support Equipment, General Specification for," dated 6 November 1956.

d. MIL-F-25604 (USAF), "Fuel, Rocket, Unsymmetrical Dimethylhydrazine," dated 13 February 1957.

e. MIL-E-4158B, Amendment 1, "Electronic Equipment, Ground, General Requirements for," dated 7 November 1958.

f. MIL-D-9412D, "Data for Ground Support of Weapon Systems, Support Systems, Subsystems, and Equipment," dated 10 June 1958.

2. LOCKHEED MISSILES AND SPACE DIVISION

a. Compliance with the following Contractor specifications shall be required. Later Air Force approved revisions shall be subject to separate negotiations.

(1) LMSD-6117A "General Environmental Specification for Discoverer, MIDAS, and Sentry Programs," Revision A, dated 24 June 1959.

(2) LMSD-6229, "Subsystem E Specification for E-1 (Component Test) Payload," dated 30 April 1959.

(3) LMSD-445000, "Subsystem F Specification for F-1 Equipment," dated 15 May 1959.

(4) LMSD-6231, "Subsystem F Specification for F-2 Equipment," Revision A, dated 18 March 1959.

b. Compliance requirements for the following Contractor specifications which are to be prepared shall be subject to both Air Force approval and separate negotiations.

(1) LMSD-6230, "Subsystem E Specification for E-2 Equipment."

(2) LMSD-424178, "Subsystem E Specification for E-5 Equipment."

(3) LMSD-6232, "Subsystem F Specification for F-3 Equipment."

(4) LMSD-6234, "Ground-Space Communications Subsystem Specification for Sentry Program."

(5) LMSD-445044, "Subsystem H Specification, Sentry Program."

(6) LMSD-445461, "Service and Handling Equipment, Sentry."

(7) LMSD-445462, "Launch Monitoring Equipment Specification, Sentry."

(8) LMSD-445463, "Checkout Equipment Specification, Sentry."

B. VEHICLE CODES. Ground equipment shall be designed to conform to the latest issue of the following documents, which shall be used as reference and adhered to where applicable.

1. Interstate Commerce Commission, "Motor Carrier Safety Regulations Revision of 1952."

2. State of California, "California State Vehicle Code - September 1957."

III. EQUIPMENT REQUIREMENTS

A. GENERAL. Ground equipment for the Sentry Program shall include the equipment necessary to perform the following functions:

1. Inplant handling, servicing, and maintenance
2. Inplant testing and checkout
3. Ground handling
4. Ground servicing and maintenance
5. Launch monitoring and control
6. Vehicle subsystem checkout
7. Vehicle system checkout
8. Receipt of reconnaissance and telemetry data
9. Vehicle acquisition and tracking
10. Ground command
11. Ground timing

12. Computation
13. Interstation communications
14. Intrastation communications
15. Vehicle control and display
16. Data processing and analysis
17. Ferret inflight calibration
18. Ferret evaluation and command
19. Ferret data calibration
20. Atlas booster real-time telemetry data display and recording.

B. SPECIAL TEST EQUIPMENT. Special test equipment shall consist of instrumentation and controls, calibration and simulation equipment, analyzers, transcription, monitoring equipment and data acquisition and processing equipment used during the in-plant fabrication, assembly, testing, and checkout of subsystem, systems, and the satellite vehicle. Maximum use will be made of subsystem and system checkout equipment for in-plant testing to avoid duplicate design effort.

C. GROUND SUPPORT EQUIPMENT

1. GROUND HANDLING EQUIPMENT. Ground handling equipment shall be capable of supporting the satellite vehicle and its components, including the visual, ferret, and recovery capsule subsystem equipment, and shall consist of transport trailers, maintenance and checkout stands, handling dollies, yokes, and slings, and other handling equipment as listed in Tab 5 of Section 2.

2. GROUND SERVICING EQUIPMENT. Ground servicing equipment shall be capable of servicing the vehicle, and shall consist of fuel and acid handling equipment, umbilical mast plumbing and wiring, personnel hi-lift, and other required servicing equipment as listed in Tab 5 of Section 2.

3. LAUNCH MONITOR AND CONTROL EQUIPMENT. Launch monitor and control equipment shall be capable of power conversion and distribution within the launch complex, of monitoring and controlling

launch pad servicing functions and countdown operations, and shall consist of electrical conversion and distribution equipment, including launch complex cabling, blockhouse consoles, recorder and countdown equipment, closed-circuit television, and other required launch monitor and control equipment, as listed in Tab 5 of Section 2.

4. VEHICLE SUBSYSTEM CHECKOUT EQUIPMENT. Subsystem checkout equipment shall be capable of evaluating and recording the performance of each subsystem or unit within preselected limits and isolating component malfunctions. Vehicle subsystem checkout equipment shall consist of checkout consoles for the propulsion, auxiliary power, guidance and control, vehicle-borne communications, visual, ferret, and recovery capsule subsystems; checkout consoles for pressurization and tankage; checkout equipment for the telemeter units and beacons; and other vehicle subsystem checkout equipment as listed in Tab 5 of Section 2.

5. VEHICLE SYSTEM CHECKOUT EQUIPMENT. The vehicle system checkout equipment shall be capable of evaluating and recording the performance of each subsystem or unit operating as an integrated system. The vehicle system checkout equipment shall consist of an automatic control section composed of a test programmer, automatic evaluation equipment providing readout by printed document and lights; vehicle propulsion and guidance sections vehicle communication section, power supply and distribution section, visual, ferret, and recovery capsule sections.

D. SATELLITE GROUND CONTROL EQUIPMENT

1. VERLORT RADAR EQUIPMENT. The VERLORT radar equipment shall be capable of obtaining tracking information in the form of azimuth, elevation, and slant range through the use of S-band radar equipment which interrogates a vehicle-borne S-band transponder by means of coded pulses. The VERLORT equipment shall also provide a command capability through the use of an additional command pulse. The VERLORT radar equipment shall include command encoding equipment, analog computers (for acquisition and rough orbit computations), digital data output equipment, standby power units, and antennas. The equipment is listed in Tab 5 of Section 2.

2. VHF ACQUISITION AND TRACKING EQUIPMENT. The VHF acquisition and tracking equipment shall provide the means for accomplishing initial acquisition and rough tracking of the vehicle. The equipment shall consist, in part, of tri-helix antennas with associated control equipment, preamplifiers, multicouplers, and phase-coherent Doppler receivers. The tri-helix antenna output shall perform three functions by providing an RF signal which is used for acquisition and

tracking; telemetry information which is fed to a telemetry receiver for data reduction; and Doppler information which is fed to a phase-coherent receiver for vehicle velocity determination. The remaining integral part of the VHF acquisition and tracking equipment shall consist of TLM-18 (60-foot parabolic dish) antennas with associated control and drive equipment, preamplifiers, multicouplers for telemeter and reconnaissance data receiving equipment, and null seeking error signal units which shall provide control information for directing the 60-foot dish antenna. The TLM-18 antenna output shall consist of a reconnaissance data channel, telemetry channels, and synchro data. The VHF acquisition and tracking equipment described is that normally found at a tracking and acquisition station; however, depending upon the locality and requirements of the individual station, instrumentation may vary. The equipment is listed in Tab 5 of Section 2.

3. GROUND CONTROL AND DISPLAY EQUIPMENT. The ground control and display equipment shall be capable of displaying vehicle space position parameters and vehicle equipment status, such as vehicle temperatures, vehicle equipment power levels, vehicle orientation rates (yaw, pitch, roll), etc. It shall provide controls for acquisition and tracking equipment, and shall include a capability for issuing real-time commands to the vehicle. The ground control and display equipment shall consist of supervisor's consoles, master control consoles, guidance computer panels, acquisition programmers, and plotting boards. The equipment is listed in Tab 5 of Section 2.

4. DATA HANDLING AND COMPUTATION EQUIPMENT. The data handling and computation equipment shall handle, process, and convert vehicle functional and tracking data, accomplish mission scheduling, and support operations control. The equipment shall consist of computers; data processing equipment; data analysis equipment; and data conversion and buffering units necessary to operate slaving, recording, real-time data displays, and tracking equipment. The equipment is listed in Tab 5 of Section 2.

5. VHF DATA RECEIVING EQUIPMENT. The VHF data receiving equipment shall provide the means to receive, demodulate, record, demultiplex, and furnish sensor data from F-1 payloads and boost-phase Atlas booster data to the display equipment. This equipment shall consist of TLM-18 automatic tracking antennas (see Paragraph 2 above), FM receivers, demultiplexing units, and recorders. The equipment is listed in Tab 5 of Section 2.

6. UHF ACQUISITION AND TRACKING EQUIPMENT. The UHF tracking and acquisition equipment shall provide the capability for searching for and acquiring the vehicle prior to the determination

of precise vehicle coordinates, as well as tracking the vehicle to ascertain precise vehicle azimuth, elevation, and range. The UHF tracking and acquisition equipment shall consist of a precision UHF direction finder for acquisition and tracking and CW distance measuring equipment for range tracking; associated with these major elements are command transmitters, transmitting antennas, telemetry receivers and associated antennas, computers for acquisition and orbit computations, digital data output equipment, and standby power units The equipment is listed in Tab 5 of Section 2.

7. UHF DATA RECEIVING EQUIPMENT. The UHF data receiving equipment provides the means of receiving and recording payload sensor data and furnishing it to readout devices and to the sensor display consoles The UHF data receiving equipment shall consist of high-gain receiving antennas, demodulators, and recorders. The equipment is listed in Tab 5 of Section 2.

8. UHF COMMAND TRANSMITTING EQUIPMENT. The UHF command-transmitting equipment shall provide the means to transmit digital real-time commands from the ground which will activate equipment functions in the vehicle. The equipment shall consist of a high-power FM transmitter and a directional transmitting antenna. The equipment is listed in Tab 5 of Section 2.

9. PAYLOAD GROUND EQUIPMENT. The payload ground equipment shall be capable of accepting, reconstructing, and displaying visual and ferret reconnaissance data and auxiliary information. The payload ground equipment shall consist of sensor display consoles, command encoding equipment, and associated equipment. The equipment is listed in Tab 5 of Section 2.

10. GROUND TIMING AND DISPLAY EQUIPMENT. The ground timing and display equipment shall be capable of supplying master timing information for ground stations, synchronizing signals, and timing aids necessary both to establish vehicle position in orbit as a function of time and to synchronize ground station operations. The ground timing and display equipment shall consist of WWV time receivers, master time generators (synchronized with WWV), time display units, and timing terminal units for remote timing indications. The equipment required for this function of satellite ground control is listed under the headings of the equipment for which it supplies a support function. The equipment is listed in Tab 5 of Section 2.

11. INTRA/INTERSTATION COMMUNICATIONS AND DATA TRANSMISSION EQUIPMENT The intrastation and interstation communications and data transmission equipment shall facilitate the flow

of reconnaissance data, voice, teletype, launch control, and tracking information within portions of a single ground station and between ground stations. The equipment shall also provide the means for controlling and coordinating launch and postlaunch activities. The intrastation and interstation communications and data transmission equipment shall consist of the following types of network: high-speed data link, 100 wpm teletype, 60 wpm teletype, alternate voice/teletype, voice paging, hot-line direct communication, and normal voice communications. The equipment required for this function of satellite ground control is listed under the headings of the equipment for which it supplies a support function. The equipment is listed in Tab 5 of Section 2.

12. ALIGNMENT AND CALIBRATION EQUIPMENT. The alignment and calibration equipment shall provide the optical, photometric, and electronic means to align and calibrate angle tracking, acquisition, and range measuring equipment. Alignment is effected by use of boresight cameras, telescopes, target boards, and beacons after the optical and electrical axes of the antenna have been collimated. The equipment required for this function of satellite ground control is listed under the headings of the equipment for which it supplies a support function. The equipment is listed in Tab 5 of Section 2.

13. MISCELLANEOUS EQUIPMENT The miscellaneous equipment shall include maintenance and storage equipment, standard test equipment at stations outside the zone of the interior, and miscellaneous hand tools This equipment is listed in Tab 5 of Section 2.

IV. TESTING REQUIREMENTS

A. GROUND TESTS Components, subassemblies, assemblies, and integrated systems shall be subjected to development, qualification, and inspection tests, as applicable. These tests, defined in Tab 2 of this Section, shall be scheduled to provide ground equipment capable of meeting functional requirements defined in Paragraph III above.

FACILITIES

I. SCOPE

A. GENERAL. The requirements for both Contractor-furnished and Government-furnished facilities and equipment for the Sentry Program are established in this tab.

B. OBJECTIVE. Facilities shall be provided to support program administration and direction; research and development; system and flight testing; tracking, control, and telemetry; reconnaissance data acquisition and processing; and intercept, control, and recovery of reentry vehicles.

II. DESIGN CRITERIA

A. PUBLICATIONS

1. The following publications shall be used as reference documents for the Sentry Program facilities:

a. LMSD-59304 "Design Criteria and Outline Specification, Sentry Launch Complex, Point Arguello, California," dated 1 August 1958

b. LMSD-106722 "Design Criteria and Outline Specifications, Missile Assembly Building, Camp Cooke, California," dated 30 May 1958 and amended by LMSD-59316, dated 22 July 1958

c. LMSD-109014 "Basis for Design for Typical Development/Operational Tracking Station," dated 7 March 1958

d. LMSD-109005 "Design Criteria and Outline Specification, Development/Operational Tracking Station, New Boston, New Hampshire," dated 13 October 1958

e. LMSD-109004 "Design Criteria and Outline Specification; Development/Operational Tracking Station, Ottumwa, Iowa," dated 13 October 1958

2. Compliance requirements for the following Contractor specifications which are to be prepared shall be subject to both Air Force approval and separate negotiations.

a. LMSD-445046, "Ground Station Complex Specification for Sentry R1 Program."

b. LMSD-445047, "Ground Station Complex Specification for Sentry R2 Program."

c. LMSD-445048, "Launch Complex Specification, Sentry Program."

B. DESIGN STANDARDS. Facilities shall be designed to conform to the latest issues of the following design standards, codes, and specifications, which will be used as reference and adhered to where applicable:

1. OCE Engineering Manuals for Military Construction
2. USAF Installations Facility Requirements Manual
3. AFM 88-15, Standard Outline Specifications for Air Force Facilities
4. Uniform Building Code
5. National Building Code
6. National Plumbing Code
7. National Electrical Code
8. National Electrical Manufacturers Association Standards
9. American Concrete Institute Building Codes and Standards
10. American Water Works Association Standards
11. American Association of State Highway Officials Standards

12 Heating, Ventilating, and Air-Conditioning Guide

13 National Bureau of Standards Report 3079, Requirements for Concrete Masonry Design

14 American Institute of Steel Construction Manual

15 Underwriters' Laboratories Incorporated, Standards

16. American Welding Society Code

17. Applicable Local Construction Codes.

III. FACILITIES REQUIREMENTS

A. LMSD INPLANT FACILITIES. Lockheed inplant facilities utilized in the Sentry Program will be located in the Palo Alto-Sunnyvale-Santa Cruz area and in the Van Nuys area. These facilities shall support the design, fabrication, development laboratory testing, assembly, installation, production, and program management activities necessary to accomplish the objectives of the Sentry Program.

B. SANTA CRUZ TEST BASE, CALIFORNIA. The Santa Cruz Test Base shall provide the facilities for test operations involving the capability to test components, subsystems, and satellite vehicles, including engine firing, as required for development and acceptance testing. The facilities and equipment provided for the Discoverer Program shall be used for the Sentry Program. The additional test stands (2), programmed in the MIDAS Program, shall be utilized as required for the Sentry Program.

C. SUBCONTRACTORS' PLANT FACILITIES. Subcontractors' plant facilities are required to support the design, development, fabrication, testing, and administrative activities necessary to accomplish the subcontract tasks involved in the Sentry Program. Special test equipment, if required, shall be a matter for resolution in the final negotiation of each subcontract.

D. LAUNCH BASE, VANDENBERG AFB, CALIFORNIA. All flight test vehicles in the Sentry Program shall be launched from Vandenberg AFB - Point Arguello. Facilities shall provide the capability for launching at a maximum rate of two flights per month. The launch base will consist of missile assembly, shop, administration, and engineering facilities; a launch complex containing two launch pads at Point Arguello; and the necessary support facilities and utilities. The launch complex and the missile assembly, shop, administration, and engineering facilities shall be new; the balance of the launch base facilities shall be provided from the Discoverer Program.

E. TRACKING AND ACQUISITION STATION, VANDENBERG AFB, CALIFORNIA. The Vandenberg Tracking and Acquisition Station will obtain launch and ascent performance and trajectory data It will also acquire and track the vehicle; receive telemetry data, visual readout data and ferret readout data; execute inflight calibration; and provide for commands to the orbiting vehicle The existing facilities and the equipment provided at this station for the Discoverer Program will be used as required. Additional facilities shall be required to provide the visual readout capability and to convert the station to UHF Modification or addition to the VHF telemetry receiver building will be required to accommodate booster real-time telemetry display and recording equipment.

F. TRACKING AND ACQUISITION STATION, POINT MUGU, CALIFORNIA The Point Mugu Tracking and Acquisition Station will provide tracking for the launch ascent phase only. For this purpose, some of its tracking operations shall be slaved to the Vandenberg Tracking and Acquisition Station. During the orbital phase, Pt. Mugu may serve as a VHF backup station for tracking and telemetry data acquisition supporting the Vandenberg station, if required. The facilities and equipment shall consist of existing facilities provided for the Discoverer Program.

G. TELEMETRY SHIP The telemetry ship will receive telemetry data from the satellite vehicle as required. The ship as equipped for service in the Discoverer Program, including telemetry data acquisition equipment and the ship-to-air data pickup equipment, shall be used, except that ferret inflight calibration equipment shall be added.

H. TRACKING AND ACQUISITION STATION, KAENA POINT, HAWAII The Kaena Point Tracking and Acquisition Station will acquire and track the vehicle, receive telemetry data, execute inflight calibration, and command the orbiting vehicle The existing facilities and equipment provided at this station for the Discoverer Program will be used as required. Additional facilities shall be required to convert the station to UHF

I. TRACKING AND ACQUISITION STATION, KODIAK ISLAND, ALASKA The Kodiak Tracking and Acquisition Station will acquire and track the vehicle, receive telemetry data, and command the orbiting vehicle As long as this station is used, it shall be necessary for the satellite vehicle to carry a VHF transmitter in addition to the UHF transmitter. The facilities and equipment shall consist of existing facilities provided for the Discoverer Program.

J TRACKING AND ACQUISITION STATION, NEW BOSTON, NEW HAMPSHIRE The New Boston Tracking and Acquisition Station will acquire and track the vehicle; receive telemetry, visual readout and ferret readout data, execute inflight calibration and command the orbiting vehicle

K. TRACKING AND ACQUISITION STATION, OTTUMWA, IOWA. The Ottumwa Tracking and Acquisition Station shall acquire and track the vehicle; receive telemetry, visual readout and ferret readout data; execute inflight calibration; and command the orbiting vehicle.

L. TRACKING AND ACQUISITION STATION, FORT STEVENS, OREGON. The Fort Stevens Tracking and Acquisition Station shall acquire and track the vehicle; receive telemetry, visual readout and ferret data; execute inflight calibration; and command the orbiting vehicle.

M. HAWAIIAN CONTROL CENTER, HICKAM AFB, HAWAII. The Hawaiian Control Center located at Hickam AFB, Hawaii, shall dispatch and control air and sea elements of the recovery force during recovery operations in the area of the Hawaiian Islands. This center shall be equipped with the necessary communications to permit real-time command and control of both the air-borne and sea-borne elements of the recovery force. The facilities and equipment shall consist of the facilities and equipment provided for the Discoverer Program.

N. RECOVERY EQUIPMENT TEST OFFICE, EDWARDS AFB, CALIFORNIA. A field office responsible for the control of the development flight tests for the evaluation of recovery equipment and techniques will be established at Edwards AFB. The brick and mortar facilities and equipment shall be Government-furnished from existing facilities at this base.

O. PACIFIC MISSILE RANGE, POINT MUGU, CALIFORNIA. The Pacific Missile Range will be used for the final tests of the direction-finding equipment and techniques and complete recovery procedures.

P. OPTICAL TRACKING STATIONS, SPACE TRACK. Space Track Stations will be used for high-accuracy determination of orbital position. These stations will be integrated into the communications network of the Sentry Program.

Q. DEVELOPMENT CONTROL CENTER, SUNNYVALE, CALIFORNIA. The Development Control Center will be equipped and used to provide for centralized satellite system control and will:

1. Check out and integrate various equipment and stations into a system test complex

2 Direct countdown and flight operations

3. Direct transmission, processing and dissemination of tracking information

4. Generate and disseminate command and control information

5. Provide for centralized system control including the scheduling of vehicles and equipment operation, acquisition prediction, transmission of collected reconnaissance data, reconnaissance data indexing, and quality control of data

6. Provide centralized control of the Visual Recovery Reconnaissance tracking, acquisition, and command system

The facility is intended to be constructed in two primary increments. The first increment will contain a limited automatic system controls capability; the second will contain large-scale general-purpose digital computers.

R. COMPUTER FACILITY, SUNNYVALE, CALIFORNIA. The LMSD Computer Facility at Sunnyvale will accomplish the computer functions in support of flight operations on an interim basis, and will perform data smoothing, orbit computations, impact predictions, acquisition predictions, and scheduling. In particular, the computer facility will:

1 Generate nominal ephemeris data and transmit tracking station acquisition and tracking programs

2. Using tracking data, make revised orbital trajectory calculations and transmit revised acquisition and tracking programs

3. Calculate and transmit data required for setting timers and initiating recovery operations

4. Calculate and transmit predicted recovery area data

5. Assist Development Control Center in checkout and integration of tracking stations

6. Process ferret intercept, calibration, and quality control data for system technical evaluation and long-term payload control

7. Process reconnaissance operational data, and evaluate system performance to enable the Test Director to judge if recovery can or must be initiated prior to achievement of the 30-day maximum Visual Recovery Program active orbital life capability.

The LMSD Computer Facility at Sunnyvale will replace the functions being accomplished by the LMSD Computer Facility at Palo Alto for the Discoverer Program. This transfer of functions will be accomplished prior to the beginning of Sentry flight test operations. The LMSD facility at Sunnyvale will accommodate the requirements of the Sentry Program until the time that computer capacity is provided physically within the Development Control Center.

PERSONNEL

I. SCOPE

A. GENERAL. The requirements for the development of a coherent personnel capability for the Sentry Program are established in this tab

B OBJECTIVES. The objectives of the personnel subsystem development for the Sentry Program are:

1. Provide a personnel capability to control, operate, and maintain the program

2. Evaluate this personnel subsystem and its development as a model for the development of an AF personnel subsystem

3. Establish plans and methods to later develop and provide an operational capability.

II. PERSONNEL PROGRAM CRITERIA

A PUBLICATIONS. Compliance with the following documents and their references shall be required

1. AFBM Exhibit 57-8A, "Human Engineering, Design Standards for Missile Systems Equipment," dated 1 November 1958

2. WDT Exhibit 56-5C, "Technical Manuals Program," dated August 1958

3 WDT Exhibit 57-7, "Maintenance Analysis, Program for Ballistic Missile Weapon Systems," dated 17 October 1957, or amended 6 February 1958

4 AFBM Exhibit 58-18B, "Qualitative Personnel Requirements Information," dated 26 June 1959.

5 WDD-59-TS-175, "Qualitative Personnel Requirements Information for Sentry/MIDAS, Test Organization, Part I," dated 15 May 1959

6. AFR 50-9, "Special Training," dated 23 January 1959

7 AFR 50-23, "Training to Support Missiles," dated 6 August 1957

8. AFR 5-47, "Weapon System Documents," dated 29 August 1956

9. MIL-T-4857B (USAF), "Training Equipment, Weapon System, Specification & Specification Compliance Test Outlines, Instructions and Requirements for Inspection of," dated 18 December 1957

10 WDT Exhibit 56-4, "Training Parts Provisioning Document for USAF R&D Service Test or Production Equipment Contracts (WS-107A/315A)."

11. WDD-59-TS-172, "Sentry Training Concept," dated 15 July 1959.

III. RESPONSIBLE ACTIVITIES

A. GENERAL. The tasks of human engineering, personnel requirements development, training, and manuals and other job aids development shall be to forecast and meet the requirements of the Sentry personnel subsystem (to include both Contractor and AF cadre personnel and the planning, training, evaluation, and equipment required to develop and support these personnel) so that it will remain in step with hardware development

B. HUMAN ENGINEERING The human engineering program shall participate in the design and development of the system hardware so as to establish and incorporate human factor objectives and criteria, ensure proper allocation of system functions to men and machines, describe the sequences of operator decisions and actions, incorporate maintainability into equipment design and arrangement, and provide for efficient equipment and work-space layout to include the man-man- and man-machine communication links; participate in and conduct reviews, analyses and studies to evaluate and verify from a human factor's standpoint the adequacy of initial modification design and to provide a basis for modification of equipment and/or procedure. This includes a human factor review of system operation for each test flight, and field analysis to detail the potential and actual failures of the personne ubsystem and to recommend remedial action

C. PERSONNEL REQUIREMENTS Personnel requirements information for the launch base, each tracking and acquisition station, and each control center shall be provided as appropriate. Personnel requirements information thus provided will reflect available information to be developed in consonance with the development of the Sentry Program

D. TRAINING. A training program consistent with the personnel phase-in schedule will be planned and conducted to fulfill the training requirements generated by the manning of the launch base, each tracking and acquisition station, and each control center. This program provides for both individual and unit training and will be conducted at the Contractor's plant, at associate or subcontractors' plants, or at the test sites as necessary. The training program shall also determine which training devices and aids are required, determine the objective characteristics of these aids and provide those required; participate in studies of the feasibility of using simulation techniques and equipment to provide means for developing, evaluating, and maintaining system proficiency; and study special training requirements of the Sentry Program.

E. MANUALS AND JOB AIDS. The manuals development program will plan for and provide for the development of Class III Utility Manuals and Class II Interim Manuals. The class of manuals to be provided will be determined by the extent of modification and/or replacement the equipment is to undergo prior to design freeze for the operational Sentry Program. The program will provide centralized control as required to perform surveillance of manual use, procedures for revision and for the issuance of standardized procedures throughout the system.

LOGISTICS

I. SCOPE

A. GENERAL. The requirements for logistic support of the flight test operations of the Sentry Program are established in this tab.

B. OBJECTIVE. The objective of the logistic operation shall be to procure, store, transport, issue, maintain, modify, and repair the supplies and equipment necessary to maintain the launch schedule and to support the flight test objectives.

II. LOGISTIC CRITERIA

A. PUBLICATIONS. Compliance with the following documents shall be required in the development of the logistic plan for the Sentry Program.

1. LMSD-427102, "Reliability Requirements and Reliability Program for the Sentry Program," dated 19 March 1959

2 WDT Exhibit 57-7, "Maintenance Analysis Program for Ballistic Missile Weapon Systems," dated 17 October 1957 as amended 6 February 1958

3. WDTC Exhibit 57-29, "Test Ground Support Equipment, Spares Therefor, and Spare Parts for Missiles for the Test Program," dated 15 April 1957 as revised 15 October 1957.

III. LOGISTIC SUPPORT REQUIREMENTS

A. CONTROL FUNCTION A logistics control organization shall be established at the Contractor's home plant site. This activity shall establish the initial levels of equipment, materials, and spares in the various bonded storage areas; maintain and coordinate the flow of new, serviceable, and reparable Government-furnished/Contractor-furnished equipment items between stations; establish initial depot level maintenance capability requirements; establish initial organizational level maintenance capability requirements; coordinate use of Government-furnished transportation; continually evaluate and program changes to the logistic plan of operations, and prepare and submit reports as required.

B. SUPPLY FUNCTION

1. HOME-PLANT SITES. A depot level supply center for all Sentry supply functions shall be established at the Contractor's home plant site. This depot activity shall operate bonded storage areas; procure, issue, and ship new and serviceable Government-furnished/Contractor-furnished equipment items to test site bonded storage areas; issue to maintenance activities reparables received from test sites; and prepare data for reports required in Paragraph A above.

2. TEST SITES Organizational level supply centers shall be established at the principal test sites These activities shall operate the bonded storage areas; receive and issue new and serviceable Government-furnished/Contractor-furnished equipment items; issue reparable Government-furnished/Contractor-furnished equipment items to organizational maintenance activity; ship depot level reparables to depot maintenance activity; and prepare data for reports required in Paragraph A above.

C. MAINTENANCE FUNCTION

1. HOME-PLANT SITES A depot level maintenance activity shall be established at the Contractor's home plant site. This activity shall receive reparable items from the bonded storage areas; analyze the reparables for required materials and spare parts and effect the necessary repairs: return serviceable items to supply; and prepare data for reports required in Paragraph A above.

2. TEST SITES An organizational level maintenance activity shall be established at each test site which has a bonded storage area, This activity shall receive reparable items from the bonded storage areas; analyze the reparables for required materials and spare parts and effect the necessary repairs; return serviceable items to supply; and prepare data for reports required in Paragraph A above.

D. TRANSPORTATION

1. Transport of serviceable and reparable equipment between locations as required to support the Sentry Program shall be furnished as indicated in Tab 4 of Section 2.

E. SPARES

1. For the purposes of this Program, the definition of spares shall be that of WDTC Exhibit 57-29 and as further clarified below:

a. Spares shall be defined as those portions of the Satellite Systems inventory which are required for maintenance, repair, overhaul, or modification of ground support equipment, ground operating equipment, and flight vehicles called for by or in support of the contract, whether fabricated by the Contractor or purchased by the Contractor from others. Spares shall be further classified as follows:

(1) Spare equipments shall be defined as complete prime operating units or major chassis. Examples of spare equipments are VHF Acquisition Transmitter, S-Band Beacon Transponder, VERLORT Radar Modulator, etc.

(2) Spare parts shall be defined as components, assemblies, sub-assemblies, or parts of a prime operating unit or major chassis. Examples of spare parts are bolts, printed circuit cards, microswitches, etc. Spare parts shall be further broken down into common and peculiar spare parts.

(a) Common Spare Parts - Common spare parts shall be defined as hardware and electronic items readily available from more than one source of supply

(b) Peculiar Spare Parts - Peculiar spare parts shall be defined as hardware and electronic items available from a sole source of supply to include standard items that have been modified, subjected to special test standards or parts that have been manufactured to meet a specific technical application.

LAUNCH PLAN

I. SCOPE

A. GENERAL The launch plan, for planning purposes use only, is established in this tab.

B. OBJECTIVE. The objective of the launch plan shall be to provide the planning instrument which together with the Sentry Program Objectives of Section 1 shall form the basis for the Work Statement of Section 2.

II. LAUNCH PLAN

A. The Atlas-boosted Sentry flight vehicles shall be planned to be launched from Vandenberg AFB - Point Arguello as follows:

Readout	Recovery	Date
1		April 1960
1		June 1960
1		August 1960
1		October 1960
1		November 1960
1		December 1960
1		February 1961
1		April 1961
1		May 1961
1		June 1961
1	1	July 1961
1	1	August 1961
1	1	September 1961
1	1	October 1961
1		November 1961

0.0 INTRODUCTION TO STATEMENT OF WORK

0.1 The Lockheed Aircraft Corporation Missiles and Space Division shall plan and conduct a program of research and development leading toward the attainment of the satellite vehicle system, described in Section 1 as the Readout portion of the Sentry Program.

0.2 Subject to the overall management of the BMD/BMC team, the Lockheed Missiles and Space Division shall fulfill responsible technical direction of the Readout portion of the Sentry Program as Prime Contractor. Government approval of the technical decisions of the Contractor shall not be required prior to implementation, except as specifically set forth elsewhere in this contract. This provision should not, however, be construed as in any way limiting the right of the Government to direct or redirect the technical aspects of the Contractor's efforts at any time. Where such direction affects costs or schedules, or is contradictory to the provisions of this contract, normal contract change procedures shall apply

0.3 The program of research and development is to be conducted as part of a continuing effort; this Work Statement covers the period from the completion of Contract AF 04(647)-97 through 31 December 1960. To assure that a measure of progress will be available, the Contractor shall provide a detailed schedule of milestones extending through calendar year 1961. Progress toward, and the attainment of these milestones shall be reported monthly.

0.4 The Contractor's drawings shall be prepared in accordance with specification MIL-D-5028B for items of airborne and ground equipment to be used during the Readout portion of the Sentry, Research and Development Program, with the following deviations referenced to paragraphs of specification MIL-D-5028B:

a. Drawing titles shall be in general accordance with MIL-D-5028B but need not comply with the precision required in the use of abbreviations, periods in abbreviations, and the H-6-1 catalog (Paragraph 3.3.1).

b. Weight of parts shall not be shown on drawings (Paragraph 3.3.3).

c. Breakdown of drawings need not conform. Vehicle drawings may be broken down so that equipment installations and structural drawings are separate (Paragraph 3.4.1).

d. Electrical harness assembly drawings are not required; however, photographs of wiring boards shall be made available upon specific request (Paragraph 3.4.1.2)

e. Tube bend data shall not be required (Paragraph 3.4.1.4).

f. Electrical harness installation drawings shall not be required (Paragraph 3.4.1.5).

g. Special notes identifying Specification Control Drawings shall not be required (Paragraph 3.4.4.3).

h. Alteration drawings shall be made for functional schematic changes to commercial items used in ground support and checkout equipment. Photographs will be available for mechanical structure changes to commercial items used in ground support and checkout equipment (Paragraph 3.4.4.4).

i. Legibility of drawings shall apply only to the extent that every line, letter, and character shall be readable on a shop print (blueprint, diazo, etc.) made as a one generation reproduction from the working tracing (Paragraph 3.8).

j. On any drawing requiring information concerning processes, such as heat treatment, welding, finishing hardness, etc., the only specification to be listed shall be Lockheed Aircraft Corp. Master Process Specification 100 (Paragraph 3.3.8).

Contractor and subcontractor drawings pertaining to items for use during the research and development program need not be delivered to the Air Force but shall be made available to the Air Force as specifically requested by drawing number. Commercial drawings will generally not be available during the research and development program; however, the Contractor will request a commercial vendor to submit drawings upon receipt of a specific request from the Air Force.

0.5 Division of Responsibilities Between LMSD and Convair

0.5.1 Mating of the Atlas booster to the Sentry readout vehicle shall be a joint effort by LMSD and Convair, and shall be accomplished at Vandenberg AFB. The time and place for composite systems checkout and compatibility tests shall be determined by mutual agreement at Vandenberg AFB within current flight test working group procedures. This work shall be accomplished with Lockheed and Convair working on their respective equipment, or as mutually arranged.

0.5.2 Lockheed has overall systems responsibility as Prime Contractor. Convair shall have the status of Associate Contractor within the scope of the readout portion of the Sentry Program.

0.5.3 Lockheed shall be responsible for the Sentry readout satellite vehicle and supporting equipment, including the booster adapter.

0.5.4 Convair shall be responsible for the Atlas booster and that portion of the ground support equipment for which it is responsible in the WS-107A-1 Program.

0.5.5 Convair shall be responsible for all modification and design changes to the Atlas booster and ground support equipment referenced in Paragraph 0.5.4 above. Modifications and/or changes to subsystem equipment furnished to the WS-107A-1 Program by Associate Contractors shall be the responsibility of those Associate Contractors. However, it shall be Convair's responsibility to make timely integration of all changes and modifications.

0.5.6 It shall be Lockheed's responsibility to coordinate with Convair all design engineering and installation of equipment that could affect the operation of either the Atlas booster or basic test facility at Vandenberg AFB.

0.5.7 Lockheed, as Prime Contractor, shall be responsible for overall conduct of the readout portion of the Sentry Program under the direction of the AFBMD.

0.5.8 Lockheed shall be responsible for specifying the overall closed-loop (guided) reference trajectory from launch of the Sentry/Atlas vehicle to orbit injection of the Sentry vehicle.

0.5.9 Lockheed shall establish coordination with Convair to insure that the reference trajectories specified by Lockheed satisfy the necessary design constraints of the Atlas vehicle.

0.5.10 Convair shall be responsible for furnishing Lockheed with sufficient data as required for determination of the reference trajectories, such as weights, propulsion data, etc., including design tolerances and non-standard conditions.

0.5.11 Lockheed shall be responsible to the AFBMD test controller for the conduct of the Sentry readout vehicle countdown in accordance with the countdown procedures developed jointly by LMSD and Convair and approved by the Vandenberg AFB flight test working group. If at any time during the countdown the Convair test conductor detects a condition which would preclude achievement of test objectives, this condition shall be reported to the AFBMD test controller for resolution.

0.5.12 Convair shall be responsible to the AFBMD test controller for the conduct of the Atlas booster countdown in accordance with the countdown procedures developed jointly by LMSD and Convair and approved by the Vandenberg AFB flight test working group. If at any time during the countdown the Convair test conductor detects a condition which would preclude achievement of test objectives, this condition shall be reported to the AFBMD test controller for resolution.

0.5.13 LMSD shall be responsible for publishing the Sentry Detailed Test Objectives after coordination with Convair on those items that concern the Atlas, its support, and its operation. Similar procedures shall be followed for other documents which require a coordinated effort.

0.5.14 Convair shall be responsible for data recording and data reduction of booster landline instrumentation utilized at Vandenberg AFB Lockheed shall be responsible for data recording and data reduction of the Lockheed-furnished satellite vehicle and supporting equipment instrumentation.

0.5.15 Convair shall be responsible for the airborne telemetering requirements of the Atlas booster Convair shall be responsible for the reduction of data obtained from the telemetering equipment carried within the Atlas booster Lockheed shall be responsible for the provision of real-time telemetry data displays and recordings for the Atlas booster during the boost phase

0.5.16 Lockheed shall be responsible for furnishing design criteria for the launch complex at Vandenberg AFB The criteria shall be coordinated with Convair by Lockheed.

0.5.17 Lockheed shall be responsible for the installation and checkout of all launch complex GSE unique to the Sentry readout vehicle, except for blockhouse-to-pad cables which shall be furnished to Convair by Lockheed and installed by Convair.

0.5.18 Convair shall be responsible for the detail scheduling of WS-107A-1 complex activities including Sentry Readout Program activities that take place concurrently

0.5.19 Lockheed shall be the launch complex manager

0.5.20 Lockheed shall be responsible for the integrated Sentry/Atlas booster countdown manuals Upon completion of the integrated countdown manuals, they will be submitted to the AFBMD flight test working group for review and approval

1.0 GENERAL

1.1 Management. Contractor management of the readout portion of the Sentry Program shall be established to satisfy the requirements of Paragraph 0.0 (Introduction to Statement of Work) and the paragraphs which follow. The management activities shall be defined as the centralized direction of the program by the Prime Contractor, including management activities in the specific areas of space system management, planning, development, test and operations, program administration, and reliability. The Contractor shall be supported in this effort by associate contractors. It shall be the responsibility of the Contractor to maintain close coordination with associate contractors as well as Government agencies involved with the program.

1.2 Systems

1.2.1 Development and Integration

1.2.1.1 Analyses, Studies, Coordination. The Contractor shall perform engineering and operational analyses, system design studies, modification design and engineering liaison, production coordination and data release, technical support for the system integration of all subsystems being developed under this contract, production engineering, materials processes, components, and standards service, and shall perform all other tasks required to insure efficient development of the readout portion of the Sentry satellite system. The scope of such activity shall be sufficient to coordinate the work further described under each subsystem, to reach the program milestones, and to maintain a continuing review of the adequacy of both the detail requirements of this contract and performance against those requirements

1.2.1.2 Advanced Planning. The Contractor shall be responsible for developing, establishing, and maintaining the Weapon System Development Plan in accordance with Air Force Management Procedures ARDC 80-4, for investigation of new systems and applications related to the readout portion of the Sentry Program, for performing studies of weapon system concepts, for defining preliminary operational concepts and plans to form a logical datum for system design criteria, and for investigating alternate applications of the readout portion of the Sentry system and its derivatives. The results and recommendations of these studies shall be reported to AFBMD

1.2.1.3 Geophysical Environment (Subsystem J)

1.2.1.3.1 The Contractor shall determine and provide the following information to the Geophysics Research Directorate, Air Force Cambridge Research Center, through the WS-117L Weapon System Project Office:

a. Requirements for geophysical data and design criteria, including justification for all such requirements

b. The form or manner in which the Geophysics Research Directorate shall provide geophysical data and design criteria in those areas approved as valid requirements by the Weapon System Project Office

c The order of priority for geophysical data and design criteria which will most effectively meet the requirements for system design and development.

1.2.1.3.2 The Contractor shall, with the concurrence of the Weapon System Project Office, provide to the Geophysics Research Directorate the necessary facilities, telemetry channels, power source, vehicle design, technical information, and other items which will enable the Geophysics Research Directorate to utilize Sentry test vehicles for collection of geophysical design data as defined and required above. The Contractor's activity with respect to Subsystem J also shall include liaison with the Geophysics Research Directorate to insure timely exchange of requirements and technical information.

1.2.1.4 Subsystem I Interface. To insure optimum design and development of the readout portion of the Sentry system and the proper meshing of applicable portions of the collection control system and of Subsystems E and F with Subsystem I (the Data Processing Subsystem), LMSD and the Prime Contractor for Subsystem I shall collaborate to make arrangements for a sufficiently full and timely flow of information from each project to the other and from each set of subcontractors to the other, as their work affects the interface areas. They shall jointly arrange orderly means to bring to light any divergencies between the two parts of the total program, to effect the best possible compromises as they are needed, and to refer to the Government Contracting Officers (LMSD to BMC and Prime Contractor Subsystem I to RADC) for decision on any questions which cannot be resolved by agreement. They each shall be responsible for maintaining constant vigilance of the interface areas and the timely notification and referral to AFBMD/Sentry Project Office of any potential or actual problem areas, or areas of omission by either group which would affect the overall system capability. It shall be the intent of the procuring agencies (BMD/RADC) to assist in the solution of interface problems before the problems require arbitrary decision.

1.2.1.5 Design Test Data Reduction. The Contractor shall perform the reduction of data derived from all inplant subsystem, development, qualification, and inspection test efforts associated with the readout portion of the Sentry Program.

1.2.2 Reliability The Contractor shall conduct a reliability program for the readout portion of the Sentry Program which will satisfy the reliability objectives given in Paragraph V, Tab 1 of Section 1. In carrying out this program the Contractor shall follow the procedures of Appendix A to LMSD-427102, "Reliability Requirements for the Sentry Program," dated 19 March 1959. To insure that the reliability of contractually deliverable items conforms to the reliability requirements, the Contractor shall carry out a program of quality assurance in accordance with the requirements of MIL-Q-5923(C), Phase A, in which the reliability requirements shall govern the certification of the quality in all cases where the reliability of the equipment is effected.

1.2.3 Contract Data Preparation. The Contractor shall perform all activities required for the preparation of reports, proposals, bills of material, and other publications associated with the readout portion of the Sentry Program. Specifications for the contract period covered by this Work Statement shall be as defined in LMSD-445087, "Specification Program for Discoverer, MIDAS, and Sentry Programs," dated 15 April 1959, and shall be submitted in accordance with LMSD-6246, "Specification Submittal Requirements for Discoverer, MIDAS, and Sentry Programs," dated 22 July 1959. Report requirements for the contract period covered by this Work Statement shall be in accordance with AFBM 58-1 Exhibit, as defined in LMSD-445722, "Program for Submittal of Contractor-Furnished Reports for Discoverer, MIDAS, and Sentry," except for the following deviations:

a. Standard size 8 inches by 10-1/2 inches or the alternate size 8-1/2 inches by 11 inches for Contract Status Reports, Technical Operating Reports, and Technical Documentary reports. Fold-out inclosures may be used as necessary. Specific deviations may be required for LMSD reports where the content of the report in primarily large charts, graphs, etc. (Reference AFBM 58, Chapter I, Paragraph 4a.)

b. LMSD report submittals shall retain their present cover paper substance. (Reference AFBM 58-1 Chapter I, Paragraph 4e.)

c. The type of binding and/or fastening for all LMSD report submittals shall be at the option of LMSD. Comb binding shall be utilized, where practicable, until existing stocks are exhausted. (Reference AFBM 58-1, Chapter I, Paragraph 4f.)

d. Catalog cards shall not be included in LMSD report submittals. (Reference AFBM 58-1, Chapter I, Paragraph 4g.)

e. The following reports shall be submitted monthly, under one cover, (LMSD/2800) in accordance with Paragraph 2, Chapter I, of AFBM 58-1 Exhibit:

(1) Program Progress Report

(2) Facility Progress Report

(3) Production Analysis Report

f. The following reports shall be submitted monthly, under one cover, in accordance with Paragraph 2, Chapter I, AFBM 58-1 Exhibit:

(1) Funding Status Report

(2) Manpower Status Report

g. The following reports shall be submitted quarterly, under one cover, in accordance with Paragraph 2, Chapter I, AFBM 58-1 Exhibit.

(1) Program Progress Report

(2) Facility Progress Report

h. The following reports shall be submitted quarterly, under one cover, in accordance with Paragraph 2, Chapter I, AFBM 58-1 Exhibit:

(1) Financial Status Report

(2) Manpower Status Report

1.3 Personnel (Subsystem K). The Contractor shall develop the personnel subsystem as needed to support the readout portion of the Sentry Program as specified in Tab 5 of Section 1.

1.4 Flight Test and Operations

1.4.1 Flight Test Planning and Evaluation. The Contractor shall prepare test plans and establish overall requirements for Sentry readout flight tests at Vandenberg AFB. Flight test data shall be prepared for each installation and launch and shall consist of the following:

TITLE		
Data and Support Requirements	for each portion of the program	1 year prior to initial launch with periodic upgrading as required
Systems Operation Plan	for each portion of the program	6 months prior to initial launch
Flight Termination System Report	for each flight	6 months prior to launch
Detailed Test Objectives	for each flight	90 days prior to launch
System Test Directive	for each flight	30 days prior to launch
Range Safety Trajectory and Analysis Report	for each flight	30 days prior to launch
Preliminary Count-down Manual	for each flight	6 months prior to launch
Final Countdown Manual *	for each flight	15 days prior to launch
Flight Test Directive	for each flight	30 days prior to launch
Pad Safety Report	for each flight	30 days prior to launch
Preliminary System Test Report	for each flight	7-10 days after launch
Launch Pad Damage Report	for each flight	7 days after launch
Launch Report	for each flight	15 days after launch
Performance Analysis Report	for each flight	30 days after launch
Systems Test Evaluation Report	for each flight	45 days after launch
Systems Test Evaluation Summary Report	for entire program	Semiannually; 45 days after end of June and December of each year

1.4.2 Launch Bases and Tracking Stations

1.4.2.1 Facilities Design and Modification. The Contractor shall develop design criteria and monitor facility design and modifications to Government-furnished facilities included in Paragraph 1.4.2.2 required to support the readout portion of the Sentry Program.

1.4.2.2 Activation and Operation. The Contractor shall operate and maintain launch base operations at Vandenberg AFB required for the readout portion of the Sentry Program using the facilities described in Tab 4 of Section 1. Delivery of flight vehicles shall be constructive only, and upon acceptance by the USAF, the vehicles shall be returned to the Contractor as GFE for further testing. The Contractor shall plan to launch 6 such vehicles on a schedule commensurate with the program objectives. In support of this effort, the Contractor shall conduct modifications, assembly and checkout of ground systems and test vehicles; accomplish flight test operations; receive, operate, maintain, and calibrate all GFE and GFP as required; provide engineering services and coordinate changes initiated at Sunnyvale; and perform planning and coordination for conducting flight tests. The Contractor shall operate and provide routine facility maintenance at the launch base specified in Paragraph III-C 2, Tab 1 of Section 1, in support of the launch plan for the readout portion of the Sentry Program as shown in Tab 7 of Section 1. Minor facilities modifications shall be accomplished by the contractor after approval by AFBMD, where necessary to provide for equipment installation or operation improvement.

1.4.3 System Ground and Flight Test Data Reduction. The Contractor shall perform the reduction of data derived from all Sentry readout vehicle and payload systems ground tests at Santa Cruz Test Base and flight test programs. Local facilities for the reduction of metric data shall be utilized at VAFB to the maximum extent practicable.

1.4.4 Logistics. The Contractor shall operate and maintain logistic support for the flight test operations of the readout portion of the Sentry Program as specified in Tab 6 of Section 1.

1.4.5 Control Centers

1.4.5.1 Facilities Design and Modifications. The Contractor shall develop design criteria and monitor facility design and modifications to Government-furnished facilities included in Paragraph 1.4.5.2.1 required to support the readout portion of the Sentry Program.

1.4.5.2 Activation and Operation

1.4.5.2.1 Vandenberg Control Center, Vandenberg AFB. In support of the readout portion of the Sentry Program the Contractor shall operate and provide routine facility maintenance at the Vandenberg Control Center specified in Paragraph III-C 7, Tab 1, Section 1 for the required monitoring and coordinating support of the Development Control Center in Sunnyvale. Minor facilities modifications shall be accomplished by the Contractor, after approval by AFBMD, where necessary to provide for equipment installation or operation improvement.

1.5 General Manufacturing

1.5.1 Tooling

1.5.1.1 Vehicle Equipment. The Contractor shall provide tooling, including jigs, fixtures, and equipment necessary to fabricate, assemble, and check out complete readout flight vehicles at a flight vehicle delivery rate of two flight vehicles per month.

1.5.1.2 Vehicle Tooling Maintenance. The tooling specified in Paragraph 1.5.1.1 shall be maintained by the Contractor. Modifications to this tooling shall be accomplished to effect authorized readout vehicle configuration changes.

1.5.1.3 Ground Equipment. The Contractor shall develop, design, fabricate, modify, and maintain tooling necessary to fabricate, assemble, and check out all ground support equipment required in support of readout flight vehicles, including all functional test equipment required for component, subassembly and assembly checkout.

1.5.2 Manufacturing Aid (Mockup) and Display Model

1.5.2.1 Vehicle. The Contractor shall construct and maintain to the latest readout vehicle configuration a manufacturing aid (mockup) in which the external envelope of all airborne subsystems, as applicable, shall be simulated. Any display models required for development of the readout portion of the Sentry Program shall also be furnished. The Contractor shall construct and maintain to the latest readout vehicle configuration a dynamic simulation vehicle consisting of all components interconnected by the vehicle electrical harness. The dynamic simulation vehicle shall utilize operating components, interconnected by the vehicle cabling specified for the given configuration. Vehicle dynamic simulation test equipment, including subsystem and system checkout equipment, shall be considered part of the dynamic simulation vehicle operation. The Contractor shall also design and construct scale models, sand table models, and mockups required for design aids and evaluations.

1.5.2.2 Ground Equipment. The Contractor shall construct, as necessary, all mockups, sand table models, scale models, and display models of support equipment required in the development of the ground equipment complex of the readout portion of the Sentry Program.

1.5.3 Manufacturing Services

1.5.3.1 Vehicle and Ground Equipment. In support of the effort described in Paragraphs 1.5.1.1, 1.5.1.2, and subsequent hardware paragraphs, the Contractor shall provide such manufacturing services as production control, tool and vehicle planning, process engineering, and manufacturing area engineering required by the readout portion of the Sentry Program.

1.6 Special Test Equipment

1.6.1 Development

1.6.1.1 Analysis and Design. The Contractor shall design, fabricate, and maintain the special test equipment required by the readout portion of the Sentry Program, (listed in Paragraph 8.2, Tab 5 of this Section, as defined in Tab 1, Section 1. Equipment shall be modified as required to accommodate changes in vehicle or associated equipment.

1.6.1.2 Test. The Contractor shall direct, coordinate, and conduct development testing of special test equipment required by the readout portion of the Sentry Program.

1.6.2 Hardware

1.6.2.1 Fabrication and Assembly. The Contractor shall provide material procurement, fabrication, assembly, maintenance, and repair of the items of special test equipment required by the readout portion of the Sentry Program and listed in Paragraph 8.2, Tab 5 of this Section.

2.0 VEHICLE EQUIPMENT

2.1 Systems

2.1.1 Development and Integration

2.1.1.1 Analysis and Design. The Contractor shall coordinate system analysis and design to insure the compatible integration of all subsystems into a complete vehicle system for the readout portion of the Sentry Program.

2.1.1.2 Inplant Test. The Contractor shall plan and coordinate inplant development, qualification, and inspection tests as described in Paragraph IV, Tab 2, Section 1 for the readout portion of the Sentry Program. The Contractor shall determine, as accurately as possible, the environment of the satellite vehicle by means of simulated flight environment, theoretical analyses, materials studies, performance and environmental testing, and shall design proper environmental controls to enable the readout satellite vehicle to tolerate the environment.

2.1.1.3 Santa Cruz Test Base Tests. The Contractor shall plan, schedule, coordinate, conduct, and evaluate systems ground tests, including final acceptance testing, of the complete readout vehicle at the Santa Cruz Test Base.

2.1.2 Hardware

2.1.2.1 Assembly and Installation. After the fabrication and assembly of components and subassemblies, the Contractor shall stack-align the structural readout vehicles and complete the installation and final assembly of all subsystem hardware to provide completed readout vehicles in accordance with the readout vehicle delivery schedule, Tab 2 of this Section.

2.1.3 Modification and Checkout. The Contractor shall prepare checkout procedures and perform functional tests and checkout of the readout vehicle mechanical, propulsion, electrical, guidance and flight control, instrumentation, and communications equipment. The Contractor shall incorporate modifications and design changes required to meet the flight objectives and prepare the readout vehicle for shipment.

2.2 Subsystem A

2.2.1 Development

2.2.1.1 Analysis and Design. The Contractor shall provide the Sentry readout vehicle airframe defined in Tab 2 of Section 1, and develop modifications required by configuration changes, flight objectives, and/or experimental flight test data. The major areas of effort shall be concerned with the design of airframe structures, equipment installation, pressure vessels, and propellant tanks. The Contractor shall investigate the application of the increased propellant carrying capability (for dual-burn) developed in the Discoverer Program with the view of utilizing this capability to improve Sentry readout vehicle performance for optimum accomplishment of the Sentry mission. The results of these investigations will be reported to AFBMD. In support of the development effort, the Contractor shall provide technical direction; perform structures analyses, aerodynamic, aerothermal, and performance studies; and liaison and coordination with other subsystems to insure proper design interface. The Contractor shall conduct feasibility and design studies for state-of-the-art subsystem development to provide progressive improvement of reliability, capability, and operational simplicity.

2.2.1.2 Test. The Contractor shall program, conduct, and analyze results of development, qualification, and inspection testing of airframe subsystem components required by the readout portion of the Sentry Program.

2.2.2 Hardware

2.2.2.1 Fabrication and Assembly The Contractor shall provide material procurement; fabrication, and assembly of sufficient sets of airframe subsystem components to support the delivery schedule for readout vehicles, Tab 2 of this section.

2.3 Subsystem B

2.3.1 Development

2.3.1.1 Analysis and Design. The Contractor shall provide the Sentry readout vehicle propulsion subsystem defined in Tabs 1 and 2 of Section 1, and develop and integrate modifications required by configuration changes, flight objectives, and/or experimental flight test data. The Contractor shall investigate the application of the dual-burning engine (with large tanks) developed in the Discoverer Program with the view of utilizing this capability to improve Sentry readout vehicle performance for optimum accomplishment of the Sentry mission. The results of these investigations will be reported to AFBMD. In support of the development effort, the Contractor shall provide technical direction; monitoring of subcontract effort; fluid flow, heat transfer and vibration studies and analyses as may be required; and development of an orbital period control. The Contractor shall conduct feasibility and design studies for state-of-the-art subsystem development to provide progressive improvement of reliability, capability, and operational simplicity.

2.3.1.2 Test The Contractor shall program, conduct, and analyze results of development, qualification, and inspection testing of propulsion subsystem components required by the readout portion of the Sentry Program

2.3.2 Hardware

2.3.2.1 Fabrication and Assembly The Contractor shall provide material procurement, fabrication, and assembly of sufficient sets of propulsion subsystem components to support the delivery schedule for readout vehicles, Tab 2 of this section.

2.4 Subsystem C

2.4.1 Development

2.4.1.1 Analysis and Design The Contractor shall provide the vehicle-borne auxiliary power subsystem for the readout portion of the Sentry Program defined in Tabs 1 and 2 of Section 1, and develop and integrate modifications required by configuration changes, flight objectives, and/or experimental flight test data. This responsibility includes design and development of the complete vehicle wiring harness, including the destruct system, pyrotechnic systems, and preparation of an electrical schematic diagram of the vehicle and ground support equipment. The Contractor shall coordinate Sentry vehicle integration design studies with the AEC for utilization of a nuclear APU, including facilities design criteria for the use of such devices. These studies shall include hazards analyses over the complete factory-to-flight sequence, orbit lifetime probability for missions planned to include SNAP IA, a study of launch failure probability, and a re-entry analysis The solar array auxiliary power unit being developed under the MIDAS Program will replace chemical batteries as the prime energy source for the vehicle auxiliary power system when available The Contractor also shall design and develop a high energy battery auxiliary power system for back-up. In support of the development effort, the Contractor shall provide technical direction, monitoring of subcontract effort, and liaison and coordination with other subsystems to insure proper design interface. The Contractor shall conduct feasibility and design studies for state-of-the-art subsystem development to provide progressive improvement of reliability, capability, and operational simplicity

2.4.1.2 Test The Contractor shall program, conduct, and analyze results of development, qualification, and acceptance testing of auxiliary power subsystem components required by the readout portion of the Sentry Program

2.4 2 Hardware

2.4.2.1 Fabrication and Assembly. The Contractor shall provide material procurement, fabrication, and assembly of sufficient sets of auxiliary power subsystem components to support the delivery schedule for readout vehicles, Tab 2, of this Section

2.5 Subsystem D

2 5.1 Development

2.5.1 1 Analysis and Design The Contractor shall provide the guidance and flight control subsystem for the readout portion of the Sentry Program defined in Tab 2 of Section 1, and develop and integrate modifications required by configuration changes, flight objectives, and/or experimental flight test data. The Contractor shall provide technical direction, monitoring of subcontract effort, and liaison and coordination with other subsystems to insure proper design interface. In support of the development effort, the Contractor shall: (1) investigate the repackaging and redesign of the inertial reference package and the flight control electronics package into a single integrated package with improved components; (2) perform investigations leading to the design and development of orbital stabilization and vehicle attitude methods employing inertia wheels, reaction jets, and/or active differential drag devices as necessary to meet accuracy requirements, and develop resulting components; (3) develop re-entry guidance and flight control equipment as required; (4) develop the repackaging of the attitude damping system, including pitch wheel; (5) develop precise attitude indication equipment for orbital operation, including means for storage and readout of altitude indication information; and (6) monitor the development of the guidance equations for booster guidance. The Contractor shall conduct feasibility and design studies for state-of-the-art subsystem development to provide progressive improvement of reliability, capability, and operational simplicity.

2.5.1.2 Test. The Contractor shall program, conduct, and analyze results of development, qualification, and inspection testing of guidance and flight control subsystem components required by the readout portion of the Sentry Program.

2.5.2 Hardware

2.5.2.1 Fabrication and Assembly. The Contractor shall provide material procurement, fabrication, and assembly of sufficient sets of guidance and flight control subsystem components to support the delivery schedule for readout vehicles. Tab 2 of this Section.

2.6 Subsystem E

2.6.1 Development

2.6.1.1 Analysis and Design The Contractor shall provide the visual reconnaissance subsystem for the readout portion of the Sentry Program defined in Tabs 1 and 2 of Section 1, and develop and integrate modifications required by configuration changes, flight objectives, and/or experimental flight test data. The Contractor shall provide technical direction, monitoring of subcontract effort, and liaison and coordination with other subsystems to insure proper design interface. In support of the development effort the Contractor shall:

a. Conduct a study program directed toward the development of a visual reconnaissance subsystem (E-3) capable of providing 5-foot ground resolution. The use of both film and electromagnetic recording will be considered in the determination of the optimum technical approach.

b. Perform operational and systems analyses to determine design criteria for reconnaissance equipment.

c. Conduct system studies and special studies, as appropriate, in such component areas as improved image pick-up tubes, electrostatic and/or electromagnetic view data storage devices, and wide-band video and radio frequency amplifiers.

d. Establish technical requirements of the wide-band data link of Subsystem H which will be testing those models and assemblies required for equipment design criteria.

e. Develop equipment, techniques, and procedures for monitoring and evaluating the quality of the system output to:

(1) Check system operation and compare the results with performance requirements.

(2) Evaluate the results in order to consider redesign of equipment for future vehicles.

(3) Provide for programming and control of future data acquisition cycles.

(4) Determine that the vehicle and orbit data accuracy is sufficient to meet the location requirements of the system. Maximum use should be made of data available from Subsystem I in the performance of the above functions.

Equipment to be used for development purposes which does not have a function in the operational system should be set up to handle only selected system output. Automatic features should not be included in items which have the "off line" function of performing system check for development purposes.

f. Provide three primary record photographs to the Data Processing Subsystem. The data to be supplied to Subsystem I with the photo records will be determined under the requirements of Paragraph 1. 2. 1. 4. The time delay from readout of the vehicle to receipt of the data by Subsystem I will be kept to a minimum.

g. Develop or adapt from existing equipment such photographic viewing, processing, and handling equipment required to perform the ground processes existing within Subsystem E.

h. Conduct an experimental photo program for the purpose of simulating the quality output of the Visual Reconnaissance Subsystem. The simulated photography will be of such quality that its analysis will enable the production of useful design criteria for Subsystem E. The photography will also be made available for interpretation by the Data Processing Subsystem.

i. Conduct feasibility and design studies for state-of-the-art subsystem development to provide progressive improvement of reliability, capability, and operational simplicity.

2. 6. 1. 2 Test. The Contractor shall program, conduct, and analyze results of development, qualification, and inspection testing of visual reconnaissance subsystem components required by the readout portion of the Sentry Program.

2. 6. 2 Hardware

2. 6. 2. 1 Fabrication and Assembly. The Contractor shall provide material procurement, fabrication, and assembly of sufficient sets of visual reconnaissance subsystem components to support the delivery schedule for readout vehicles, Tab 2 of this Section.

2. 7 Subsystem F

2. 7. 1 Development

2. 7. 1. 1 Analysis and Design. The Contractor shall provide the electronics reconnaissance subsystem for the readout portion of the Sentry Program defined in Tabs 1 and 2 of Section 1, and develop and integrate

modifications required by configuration changes, flight test objectives, and/or experimental flight test data. The Contractor shall provide technical direction, monitoring of subcontract effort, and liaison and coordination with other subsystems to insure proper design interface. In support of the development effort, the Contractor shall perform intelligence analyses, operations and systems analyses, evaluation and development of advanced electronic reconnaissance techniques, and studies and analyses for advanced ferret equipment requirements. The Contractor shall conduct feasibility and design studies for state-of-the-art subsystem development to provide progressive improvement of reliability, capability, and operational simplicity.

2. 7. 1. 2 Test. The Contractor shall program, conduct, and analyze results of development, qualification, and inspection testing of electronic reconnaissance subsystem components required by the readout portion of the Sentry Program.

2. 7. 2 Hardware

2. 7. 2. 1 Fabrication and Assembly. The Contractor shall provide material procurement, fabrication, and assembly of sufficient sets of electronic reconnaissance subsystem components to support the delivery schedule for readout vehicles, Tab 2 of this Section.

2. 8 Subsystem G. There shall be no effort on Subsystem G for the Sentry Program.

2. 9 Subsystem H. No effort for this subsystem is included herein.

2. 10 Subsystem L. There shall be no effort on Subsystem L for the readout portion of the Sentry Program.

3. 0 GROUND EQUIPMENT

3. 1 Ground Support Equipment

3. 1. 1 Development

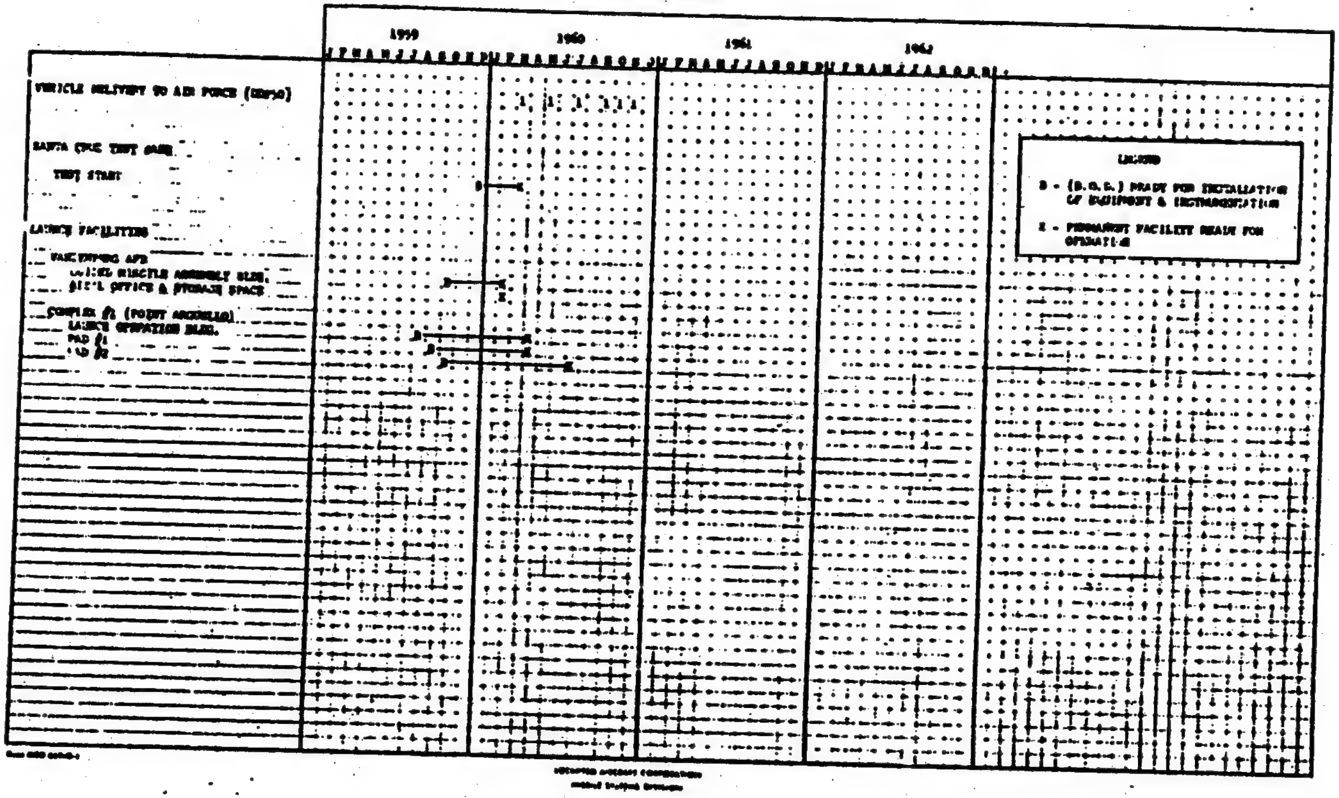
3. 1. 1. 1 Analysis and Design. The Contractor shall provide the items of ground support equipment required for the readout portion of the Sentry Program defined in Paragraph IIIC, Tab 3 of Section 1, and listed in Paragraphs 8. 3 through 8. 7, Tab 5, Section 2. This equipment shall be redesigned or modified as required to accommodate field conditions and/or vehicle changes. In support of the development effort, the Contractor shall provide technical direction, monitoring of subcontract effort, and liaison and coordination with other subsystems to insure proper

4.0 SPARES

4.1 Vehicle Equipment. The Contractor shall provide vehicle equipment spare parts in quantities sufficient to support the flight test program of the readout portion of the Sentry Program. Spares lists will be generated as a result of the logistics effort described in Paragraph 1.4.4.

4.2 Ground Equipment. The Contractor shall provide ground equipment spare parts in quantities sufficient to support the flight test program of the readout portion of the Sentry Program. Spares lists will be generated as a result of the reliability and logistics effort described in Paragraph 1.4.4.

SENTRY READOUT PROGRAM



6.0 SUMMARY OF ITEMS TO BE FURNISHED

The following items shall be furnished during the contract period from the completion of Contract AF 04(647)-97 through 31 December 1960, except as noted otherwise.

6.1 The Contractor shall complete fabrication and testing and make constructive delivery of the following satellite vehicles* to the extent herein specified.

6.1.1 Flight Test Vehicles. Flight test vehicle schedules are shown in Tab 2 of this document, and are referenced below in separate sequences for the readout portion of the Sentry Program.

6.1.1.1 Readout Series

6.1.1.1.1 Six flight test vehicles shall be delivered to Vandenberg AFB and expended in flight tests.

6.1.1.1.2 One flight test vehicle (FTV 7) shall be ninety-five percent through systems test operations at the Contractor's Santa Cruz Test Base.

6.1.1.1.3 One flight test vehicle (FTV 8) shall be sixty-four percent through modification and checkout operations at the Contractor's facility at Sunnyvale.

6.1.1.1.4 Six flight test vehicles shall be in various stages of manufacturing completion at the Contractor's facility at Sunnyvale: FTV 9 shall be 90 percent and FTV 10 shall be 45 percent through final assembly operations; FTV 11 shall be 75 percent through subassembly operations; FTV 12 through FTV 14 shall be 35 percent through fabrication operations.

6.1.2 Special Test Vehicles

6.1.2.1 One Facilities Check Vehicle shall be delivered to Vandenberg AFB.

6.2 The Contractor shall submit data as specified in the following documents:

a. LMSD-6246E, "Specification Submittal Requirements for the Discoverer, MIDAS, and Sentry Programs," dated 22 July 1959.

---

*Satellite vehicles are defined herein to be inclusive of all vehicle structural elements, all vehicle-borne equipment elements except vehicle-borne communications equipment, and spare parts therefor which are deemed necessary by the Contractor for the fulfillment of the various flight missions as presented in Tables I and II, Tab 1 of Section 1, or for the attainment of non-flight objectives of the developmental test programs.

b. AFBM Exhibit 58-1, "Contractor Reports," with deviations as noted in Paragraph 1.2.3. Tab 1, of this Section, and as defined in LMSD 445722, "Program for Submittal of Contractor - Furnished Reports for Discoverer, MIDAS, and Sentry," dated 24 August 1959.

c. LMSD 445087, "Specification Program for Discoverer, MIDAS, and Sentry," dated 15 April 1959.

6.3 The Contractor shall fabricate, test and furnish ground support equipment and satellite-ground control equipment required for the readout portion of the Sentry Program which shall be capable of attaining the objectives specified in Tab 3 of Section 1. The equipment is listed in Tab 5 of this Section. This list of equipment, to be used during research and development activities, is included herein for information purposes only, since delivery of this equipment to the Government shall be accomplished only for operational use.

7.0 GOVERNMENT-FURNISHED EQUIPMENT, FACILITIES, AND SERVICES

The Government shall furnish equipment in accordance with Paragraph 7.3, and facilities, and services as described herein:

7.1 The following Government-furnished facilities shall be required and shall be available and ready as herein indicated:

a. Vandenberg AFB Missile Assembly Building - Complete as a permanent facility

b. Vandenberg AFB additional office and storage space - Complete as a permanent facility

c. Point Arguello Launch Complex 1 - Operable as a permanent facility

d. Engineering and office space, plus necessary office furnishings and equipment at all sites

e. Outdoor storage area at all sites

f. Hazard storage area at all sites

g. Shop and laboratory space, plus necessary machine and portable tools, laboratory and testing equipment, material handling equipment, and necessary installation costs at Vandenberg AFB.

h. WADC environmental simulator

i. Sandia large centrifuge.

7.2 The following Government-furnished services shall be required at the Government facilities in Paragraph 7.1.

a. Equipment transportation to and from sites

b. Use of military base services, when available, and in accordance with DOD policy as of 1 July 1959, such as mess, guard service, transportation, recreational facilities, utilities, fire protection, first-aid, and major maintenance services of buildings, grounds, and utilities.

7.3 GOVERNMENT-FURNISHED EQUIPMENT

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
1	0	Delete		
2	0	Delete		
3	0	Delete		
4	0	Delete		
5	0	Delete		
6	1	MIT interim damping system, Engineering Model	MIT Model	On hand
7	1	Specifications and drawings for MIT interim damping system	MIT Specifications	On hand
8	0	Delete		
9	0	Delete		
10	0	Delete		
11	0	Delete		
12	As reqd	Helium (in K. bottles)	S/N GM-6830-244-2745	K. Bottles as required
13	0	Delete		
14	3	Electrical and pressure test unit	S/N 6625-117-800-001-1	On hand
15	1	Component test stand	S/N 6625-117-800-002-1	On hand
16	0	Delete		
17	0	Delete		
18	0	Delete		

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
19	0	Delete		
20	0	Delete		
21	0	Delete		
22	0	Delete		
23	1	Precision optical tracker (non-camera style)	MIK-51, including telescope ZX950-SK104541	On hand
24	0	Delete		
25	0	Delete		
26	0	Delete		
27	0	Delete		
28	As reqd	SM-65 boosters, modified for WS-117L, complete with G. E. radio guidance	Convair	As required No accountability
29	As reqd	Support equipment for SM-65	Convair	As required No accountability
30	1	SM-65 nose section and drill jig	NSL	On hand
31	0	Delete		
32	0	Delete		
33	0	Delete		
34	0	Delete		
35	0	Delete		

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
36	0	Delete		
37	0	Delete		
38	0	Delete		
39	0	Delete		
40	0	Delete		
41	10	Tuner, TN-129/APR-9	5895-519-4038	On hand
42	10	Tuner, TN-131/APR-9	5895-338-4027	On hand
43	5	Indicator, ID-226-APR-9	1660-212608719	On hand
44	5	Power Supply, PP-336/APR-9	1660-373749830	On hand
45	5	Power Supply, PP-337/APR-9	5895-307-3780	On hand
46	5	Mixer-amplifier CV-43/APR-9	5895-307-3779	On hand
47	5	Control, C-654/APR-9	1660-211688720	On hand
48	0	Delete		
49	1	Bench, work	NSL	On hand
50	0	Delete		
51	0	Delete		
52	3	Maintenance platform	1730-390-5618	On hand
53	0	Delete		
54	0	Delete		
55	0	Delete		
56	0	Delete		

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE · MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
57	0	Delete		
58	1	MIT advanced attitude damping system, Engineering Model, including specifications and drawings	NSL	July 1959
59	1	Development of guidance equations for Atlas flights	NSL	On hand
60	0	Delete		
61	1	Burroughs computer trays (Modified for WS-117L)	NSL	On hand
62	0	Delete		
63	0	Delete		
64	0	Delete		
65	0	Delete		
66	0	Delete		
67	1	Gun-sight, MK-15	S/N ZX958-SK-166092	On hand
68	1	Air supply unit, MK-1, Mod O	S/N ZX958-SK-133121	On hand
69	1	Test unit, MK-1, Mod O (camera checksite)	S/N ZX958-SK-167933	On hand
70	0	Delete		
71	0	Delete		
72	0	Delete		
73	0	Delete		

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
74	0	Delete		
75	0	Delete		
76	0	Delete		
77	3	Trainer, radar, AN/GPQ-T1	S/N 6940-300-2331	On hand
78	3	Mod kit MK-380/GPQ-1 for Item 77	S/N 6440-626-8716	On hand
79	3	Generator, diesel, PU-3081 GPQ-1W/trailer V-109/GPQ-T1		On hand
80	3	Truck, van, M220	S/N 2320-835-8600	On hand
81	0	Delete		
82	0	Delete		
83	0	Delete		
84	0	Delete		
85	0	Delete		
86	100	Parachutes, 24-ft	1670-694-8696	On hand
87	2	Body assembly, w/lens	6720-507-7045	On hand
88	2	Magazine, film	6760-286-9064	On hand
89	4	Magazine, film, 15-ft	2900-520581-1	On hand
90	0	Delete		
91	0	Delete		
92	0	Delete		

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
93	0	Delete		
94	1	Film reader, Recordak AR-10	6730-168-5834	On hand
95	0	Delete		
96	0	Delete		
97	0	Delete		
98	0	Delete		
99	0	Delete		
100	0	Delete		
101	0	Delete		
102	0	Delete		
103	0	Delete		
104	0	Delete		
105	2	Antenna system, AN/TRC-8	NSL	On hand
106	0	Delete		
107	0	Delete		
108	0	Delete		
109	0	Delete		
110	0	Delete		
111	0	Delete		
112	0	Delete		

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
113	0	Delete		
114	0	Delete		
115	0	Delete		
116	7	Heater, aircraft engine	4520-508-6496	On hand
117	0	Delete (added to Item 100)	5820-505-1722 Type R 278	On hand
118	1	Truck, water tank, CL 750	NSL	On hand
119	1	Generator, trailer mounted, 60 KW	6115-546-2147	On hand
120	0	Delete		
121	0	Delete		
122	0	Delete		
123	0	Delete		
124	0	Delete		
125	0	Delete		
126	0	Delete		
127	0	Delete		
128	1	Pickup, All-American Engineering Model 80C	NSL	On hand
129	1	Winch, All-American Engineering Model 15-C3	NSL	On hand
130	0	Delete		
131	2	Trailer, 40-gallon tank	NSL	On hand

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
132	0	Delete		
133	0	Delete		
134	0	Delete		
135	0	Delete		
136	0	Delete		
137	1 Lot	Parts and Tooling for XLR 81 Engine	NSL	On hand
138	0	Delete		
139	0	Delete		
140	0	Delete		
141	0	Delete		
142	0	Delete		
143	0	Delete		
144	0	Delete		
145	0	Delete		
146	8	Gas density gage	GRD	October 1959
147	6	Cosmic ray detector	GRD	October 1959
148	26	Micrometeorite detector	GRD	October 1959
149	12	Radiometer	GRD	October 1959
150	3	Solar ultraviolet detector	GRD	December 1959

7.3 GOVERNMENT-FURNISHED EQUIPMENT (Continued)

ITEM NO.	QTY	DESCRIPTION - INCLUDE MFG. & MODEL NO.	USAF STOCK NO.	NEED DATE
151	2	Earth electric field meter	GRD	October 1959
152	3	Mass spectrometer	GRD	October 1959
153	3	Magnetometer	GRD	April 1960
154	0	Delete		
155	0	Delete		
156	0	Delete		

8.0 GROUND SUPPORT EQUIPMENT, TEST EQUIPMENT, AND SATELLITE GROUND-CONTROL EQUIPMENT

8.1 The following items shall be used in development of the satellite vehicles and/or developed for use in support of manufacturing, checkout, transport, launch, tracking and acquisition, and control operations. All items appearing under Inplant or SCTB columns shall be classed as specialized test equipment; all items appearing under VAFB columns shall be classed as ground support equipment; all items appearing under the Travel with Vehicle column shall have variable classifications depending upon the geographical point of use at a given time; all items appearing under T/A and Control Center column shall be classed as satellite ground-control equipment.

Nomenclature	Total Quantity	L plant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.2 TEST EQUIPMENT								
Guidance and flight controls test consoles and fixtures	1 set	1 set						
RF test console	1	1						
Components test lab equipment	1		1					
Test stand complex for stands 1 and 2	1		1					
Test stand No. 1 w/soft mounts and controls	1		1					
Test stand No. 2 w/soft mounts and controls	1		1					
Instrumentation and control systems	2		2					
Ordnance test complex	1		1					
Separation test fixture	1		1					
Electronic enclosure dolly	1	1						
Environmental test chamber	1	1						
Flight signal simulator and analyzer console	1	1						
Power source simulation console	1	1						

Note: All items transferred from MIDAS Program

Nomenclature	Total Quantity	Inplant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.2 TEST EQUIPMENT (Continued)								
Control system function analyzer	1	1						
Guidance command signal simulator	1	1						
Magnetron power supply	1	1						
Vacuum system	1	1						
Meteor simulation equipment	1	1						
Gamma spectrometer detection head	1	1						
Inert atmosphere dry box	1	1						
Vibration fixtures	2	2						
Flight control mfg. test complex	1	1						
Flight computer test console	1	1						
Servo-valve signal simulator	1	1						
Pneumatic test console	1	1						
Electrical mockup	1	1						
Test stand complex for stand 3 and 4 w/blockhouse and work houses	2		2*					
Test stand No. 3 w/soft mount and control	1		1*					
Test stand No. 4 w/soft mount and control	1		1					
Test stand instrumentation	2		2*					
Tower w/instrumentation and control	1		1					Transfer 1 ea from MIDAS
GSE complex including blockhouse	1		1					
Dynamic simulation vehicle	1	1						

*New items; all other items of test equipment transferred from MIDAS Program

Nomenclature	Total Quantity	Inplant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.3 HANDLING EQUIPMENT								
Vehicle transporter	5	3	1	1				
Vehicle handling dolly	10	5*	1*	4*				
Auxiliary hydraulic cart	4	2*		2*				Transfer 2 from Discoverer & 2 from MIDAS I
Engine maintenance stand and sling	3	2*	1*					Transfer 3 from Discoverer
Vehicle handling yoke	12					12*		
Vehicle hoisting kit*	3	1*	1*	1*				
Vehicle hoisting sling and beam	3	1*	1*	1*				Transfer 3 from MIDAS I
Adapter handling dolly and sling	8					8*		Transfer 5 from Discoverer & 3 from MIDAS I
Nose cone handling dolly	9	4*	1*	4*				Transfer 3 from Discoverer & 4 ea from MIDAS I
Vehicle protective cover	14					14*		Transfer 10 ea from Discoverer and 4 ea from MIDAS I
Adapter protective cover	13					13*		Transfer 9 ea from Discoverer & 4 ea from MIDAS I
Vertical assembly fixture and sling	1	1*						Transfer 1 from MIDAS I
Forward midbody stand and sling	1	1*						Transfer 1 from Discoverer
Tank handling dolly	1			1*				
Tank handling dolly and sling	2	2*						Transfer 1 from Discoverer & 1 ea from MIDAS I

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD-445159

Nomenclature	Total Quantity	Inplant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.3 HANDLING EQUIPMENT (Continued)								
Engine removal fixture	1		1*					Transfer 1 ea from MIDAS I
Payload handling dolly	10	5	1	4				
Solar collector protective cover sets	15					15		
Vehicle pitch and roll stand	2	1*		1*				
Vehicle work stand	1			1*				
Payload shipping container	8					8		
Payload transporter	3	2		1				
Airframe handling dolly	1			1*				
Engine handling dolly	3	1*		2*				
8.4 SERVICE EQUIPMENT								
Propellant transfer equipment	5		1*	4*				80% of material dollars and 25% of manhours expended on -97
Nitrogen pressure trailer	2		2*					Transfer from MIDAS I
Air-conditioning trailer 7.5-ton	2		2*					Transfer from MIDAS I
Air-conditioning trailer 3-ton	3	1*		2*				Transfer 1 ea from Discoverer and 2 ea from MIDAS I
Engine flushing trailer	1		1*					Transfer from MIDAS I
Engine thrust chamber flushing trailer	1		1*					Transfer from MIDAS I
Vehicle alignment equipment	2	1*		1*				
CG moment of inertia equipment	2	1*		1*				Transfer 1 ea from -97

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD-445159

Nomenclature	Total Quantity	Inplant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.4 SERVICE EQUIPMENT (Continued)								
Umbilical evaluation mockup	1		1*					
Umbilical coupling sets	4			4*				75% of total funds expended on -97
Engine closure plugs	3		1*	2*				Transfer 2 sets from MIDAS I and 1 set from Discoverer
Engine service tools	3		1*	2*				Transfer 2 sets from MIDAS I and 1 set from Discoverer
Propellant transport and flushing equipment	3			3*				80% of material dollars and 25% of manhours expended on -97
Service building mechanical equipment	2			2*				25% of total funds expended on -97 contract
Special payload service equipment	2			2				
Personnel hi-lift	2			4*				Transfer 2 ea from Discoverer
8.5 LAUNCH MONITOR AND CONTROL								
Pad electric equipment	2			2*				30% of material dollars expended on -97
Blockhouse console	2			2*				50% of material dollars & 20% manhours expended on -97
Blockhouse recording equipment	1			1*				Transfer from Discoverer
SCTB test installations	1	1*						Transfer from MIDAS I
Launch site cabling	2			2*				40% of material dollars expended on -97
Junction box	2			2*				30% of material dollars expended on -97

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD 445159

Nomenclature	Total Quantity	Inplant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.5 LAUNCH MONITOR AND CONTROL (Continued)								
Squib checker/destruct simulator	2			2*				Transfer 1 ea from MIDAS I
Countdown clock	1			1*				Transfer from Discoverer
TV equipment	6			6*				

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD 4451[illegible]9

Nomenclature	Total Quantity	Implant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.6 SUBSYSTEM CHECKOUT EQUIPMENT								
8.6.1 Subsystem A								
Mass spectrometer giant leak detector	5	2*	1*	2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS Phase I
Tankage and pressurization checkout console	5	3*		2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS Phase I
Adapter Console	4	4						Transfer 3 from MIDAS
8.6.2 Subsystem B								
Propulsion subsystem checkout console	3	1*		2*				Transfer 2 ea from Discoverer and 1 ea from MIDAS Phase I
Propulsion subsystem checkout unit (mod. Bell)	3	1*	2*					Transfer 3 ea from Discoverer
Flowrater meter assembly	5	2*	2*	1*				Transfer 5 ea from Discoverer
8.6.3 Subsystem C								
Vehicle wiring analyzer (4 AMCA - 2 DITMCO)	6	6*						Transfer 5 ea from Discoverer
Cable support cart and distribution cable assembly	4	4*						Transfer 3 ea from MIDAS
Patchboards	2 per veh	2 per veh						
Auxiliary power checkout unit	6	4*		2*				Transfer 5 ea from Discoverer and 1 ea from MIDAS Phase I
Universal power supply	6	3*		3*				Transfer 6 ea from Discoverer
Battery discharge load tester	6	4*	1*	3*				Transfer 6 ea from Discoverer

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD-445159

Nomenclature	Total Quantity	Inplant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.6 SUBSYSTEM CHECKOUT EQUIPMENT (Continued)								
Dual battery charger (secondary batteries)	5	3*	1*	1*				Transfer 5 ea from Discoverer
Solar collector checkout console	1	1*						Transfer from -97
Solar collector portable checkout unit	3	2*		1*				Transfer 3 ea from Discoverer
Battery console	6	3*		3				Transfer 3 ea from Discoverer
Vehicle power monitor console	6	4*		2*				Transfer 6 ea from Discoverer
Solar collector portable checkout unit, type I	4	2		2				Transfer 4 ea from MIDAS
8.6.4 Subsystem D								
Guidance checkout console	5	2*	1	2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS I
Rate-serve table	4	2*		2*				Transfer 4 ea from Discoverer
Flight control checkout console	5	2*	1	2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS
Horizon scanner checkout console	5	2*	1	2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS I
Hydraulic test cart	5	2*	1	2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS I
High-pressure nitrogen test cart	4	2*		2*				Transfer 4 ea from Discoverer
Low-pressure nitrogen test cart	4	2*		2*				Transfer 4 ea from Discoverer

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD-445159

Nomenclature	Total Quantity	Implant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.6 SUBSYSTEM CHECKOUT EQUIPMENT (Continued)								
Mobile checkout consoles	4	2*		2*				Transfer 4 ea from Discoverer
Attitude damper checkout console	5	2*	1	2*				Transfer 4 ea from Discoverer and 1 ea from MIDAS I
Hydraulic cleaner cart	5	2*	1	2*				Transfer 3 ea from Discoverer and 1 ea from MIDAS I
Integrator panels	4	2*		2*				Transfer 4 ea from Discoverer
Static horizon sensor checkout console	2	1		1				Transfer 2 ea from MIDAS
IRP standby heat and checkout rack	3	1*	1	1*				Transfer 2 ea from Discoverer
8.6.5 Subsystem E								
Test console	6	4		2				Implant quantity includes 2 ea at EKC
Collimator	4	2		2				Implant quantity includes 2 ea at EKC
Test power supplies	4	2		2				Implant quantity includes 2 ea at EKC
Optical alignment equipment	3	2		1				Implant quantity includes 1 ea at EKC
Vacuum test chamber	2	1		1				Implant quantity includes 1 ea at EKC
Payload support test equipment	3	2		1				Implant quantity includes 1 ea at EKC
8.6.6 Subsystem F								
F-1 checkout console	3	2		1				Implant quantity includes 1 ea at AIL

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD-448859

[redacted]

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

Nomenclature	Total Quantity	Implant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.6 SUBSYSTEM CHECKOUT EQUIPMENT (Continued)								
F-2 checkout console	3	2		1				Implant quantity includes 1 ea at AIL
F-3 checkout console	3	2		1				Implant quantity includes 1 ea at AIL
8.7 SYSTEMS CHECKOUT EQUIPMENT								
Lockheed automatic checkout equipment (LACE)	2	1*		1*				Transfer 2 ea from Discoverer
Systems checkout complex	4	2*		2*				Transfer 4 ea from Discoverer with modifications to payload section
Trouble shooting checkout console	3	2*		1*				Transfer 3 ea from Discoverer
Umbilical junction box	3	2*		1*				Transfer 3 ea from Discoverer
Dynamic simulation test stands	1	1*						
Vehicle electronic simulator	3	2*		1*				Transfer 3 ea from Discoverer

* Used on MIDAS Phase II as indicated in Tab 5, Section 2 of LMSD-445159

~~CONFIDENTIAL~~

[redacted]

CONFIDENTIAL

Nomenclature	Total Quantity	Implant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.8 SATELLITE GROUND CONTROL EQUIPMENT								
(Paragraphs 8.8.1 through 8.8.8 deleted)								
8.8.9 Payload Ground Equipment								
8.8.9.1 Visual Reconnaissance Equipment								
Ground reconstruction electronics	7	2●					5●	
Test equipment, ground reconstruction electronics	3	1●					2●	
Camera, primary record	17	6●					11●	
Tester, camera, primary record	5	2●					3●	
Processor, film, primary record	6	2●					4●	
Support equipment, processor, primary record	5	2●					3●	
Calibration units, electronic	7	3●					4●	
Viewer, comparison	4	1●					3●	
Viewer, record, primary inspection	9	2●					7●	
Data reader, primary record	1						1●	
Darkroom equipment	6	2●					4●	
Printer, reassembly (9.5")	2	1●					1●	
Printer, reassembly (18.5")	1	1●						
Processor, reassembly (9.5")	1						1●	
Processor, reassembly (18.5")	1	1●						

● New items; all other items transferred from MIDAS Program

[redacted]

CONFIDENTIAL

[redacted]

~~CONFIDENTIAL~~

Nomenclature	Total Quantity	Implant Checkout	Evaluation and/or use SCTB	VAFB	AFMTC	Travel with Vehicle	T/A and Control Center	Remarks
8.8 SATELLITE GROUND CONTROL EQUIPMENT (Continued)								
Viewer, reassembly printer (18.5")	1	1*						
8.8.9.2 Ferret Reconnaissance								
Data conversion equipment, F-1	1						1*	
Evaluation and command equipment, F-2	2						2*	
Data conversion and evaluation equipment, F-2	1						1*	
Data conversion and evaluation equipment, F-3	1						1*	
Evaluation and command equipment, F-3	3						3*	
Inflight calibration equipment	3						3*	

* New items; all other items transferred from MIDAS Program

[redacted]

~~CONFIDENTIAL~~

DEFENSE TECHNICAL INFORMATION CENTER
8725 Kingman Rd Ste 0944
Ft Belvoir, VA 22060-6218

OFFICIAL BUSINESS - PENALTY FOR PRIVATE USE $300
POSTMASTER: DO NOT FORWARD

AD Number	Class	Pages	Type Copy	Source	Priority
369996	C	130	H	F	

Received Date: 24-SEP-96

22

To : 13098
Req By : DELLA FOR HARRY WA
ATTENTION: D B HINESLEY

~~SMC (AXME -STINFO)~~

160 SKYNET ST STE 2315
LOS ANGELES AFB, CA 90245-4683

400596001